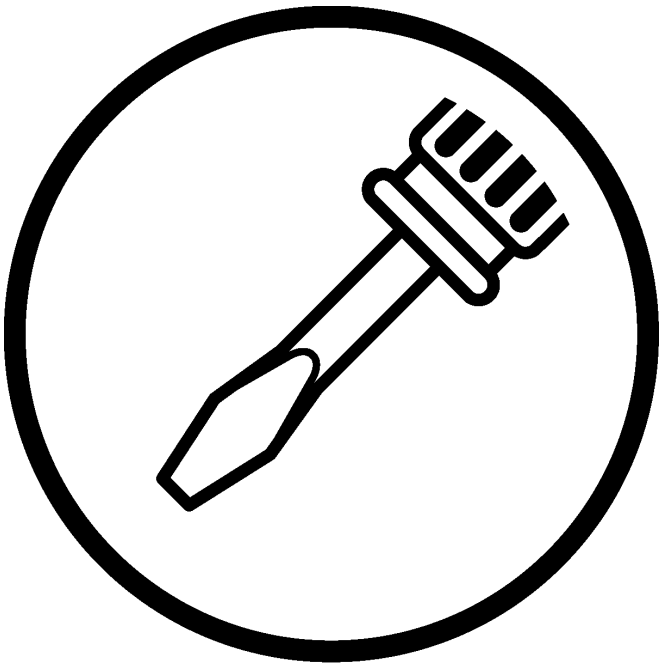
HE-800A

SERVICE MANUAL

Electronic
Excellent
Economical
E Series

Please read this manual before using the machine.
Please keep this manual within easy reach for quick reference.

ELECTRONIC LOCKSTITCH BUTTON HOLER



brother®

This service manual is intended for HE-800A; be sure to read the HE-800A instruction manual before this manual.

Carefully read the “SAFETY INSTRUCTIONS” below and the whole of this manual to understand this product before you start maintenance.

As a result of research and improvements regarding this product, some details of this manual may not be the same as those for the product you purchased.

If you have any questions regarding this product, please contact a Brother dealer.

SAFETY INSTRUCTIONS

1. Safety indications and their meanings

This service manual and the indications and symbols that are used on the machine itself are provided in order to ensure safe operation of this machine and to prevent accidents and injury to yourself or other people.

The meanings of these indications and symbols are given below.

Indications

DANGER	The instructions which follow this term indicate situations where failure to follow the instructions will almost certainly result in death or severe injury.
CAUTION	The instructions which follow this term indicate situations where failure to follow the instructions could cause injury when using the machine or physical damage to equipment and surroundings.

Symbols

•••••• This symbol (△) indicates something that you should be careful of. The picture inside the triangle indicates the nature of the caution that must be taken.
(For example, the symbol at left means “beware of injury”.)

•••••• This symbol (⃠) indicates something that you must not do.

•••••• This symbol (●) indicates something that you must do. The picture inside the circle indicates the nature of the thing that must be done.
(For example, the symbol at left means “you must make the ground connection”.)

2. Notes on safety

DANGER

Wait at least 5 minutes after turning off the power switch and disconnecting the power cord from the wall outlet before opening the face plate of the control box. Touching areas where high voltages are present can result in severe injury.

CAUTION

Environmental requirements

Use the sewing machine in an area which is free from sources of strong electrical noise such as high-frequency welders.
Sources of strong electrical noise may cause problems with correct operation.

Any fluctuations in the power supply voltage should be within ±10% of the rated voltage for the machine.
Voltage fluctuations which are greater than this may cause problems with correct operation.

The power supply capacity should be greater than the requirements for the sewing machine's electrical consumption.
Insufficient power supply capacity may cause problems with correct operation.

The ambient temperature should be within the range of 5°C to 35°C during use.
Temperatures which are lower or higher than this may cause problems with correct operation.

The relative humidity should be within the range of 45% to 85% during use, and no dew formation should occur in any devices.
Excessively dry or humid environments and dew formation may cause problems with correct operation.

Avoid exposure to direct sunlight during use.
Exposure to direct sunlight may cause problems with correct operation.

In the event of an electrical storm, turn off the power and disconnect the power cord from the wall outlet.
Lightning may cause problems with correct operation.

Installation

Machine installation should only be carried out by a qualified technician.

Contact your Brother dealer or a qualified electrician for any electrical work that may need to be done.

The sewing machine weighs approximately 56 kg. The installation should be carried out by two or more people.

Do not connect the power cord until installation is complete, otherwise the machine may operate if the treadle is depressed by mistake, which could result in injury.

Use both hands to hold the machine head when tilting it back or returning it to its original position. If only one hand is used, the weight of the machine head may cause your hand to slip, and your hand may get caught.

Be sure to connect the ground. If the ground connection is not secure, you run a high risk of receiving a serious electric shock, and problems with correct operation may also occur.

All cords should be secured at least 25 mm away from any moving parts. Furthermore, do not excessively bend the cords or secure them too firmly with staples, otherwise there is the danger that fire or electric shocks could occur.

Install the belt covers to the machine head and motor.

If using a work table which has casters, the casters should be secured in such a way so that they cannot move.

Be sure to wear protective goggles and gloves when handling the lubricating oil and grease, so that they do not get into your eyes or onto your skin, otherwise inflammation can result.
Furthermore, do not drink the oil or eat the grease under any circumstances, as they can cause vomiting and diarrhoea.
Keep the oil out of the reach of children.

⚠ CAUTION

Sewing

This sewing machine should only be used by operators who have received the necessary training in safe use beforehand.

The sewing machine should not be used for any applications other than sewing.

Be sure to wear protective goggles when using the machine.
If goggles are not worn, there is the danger that if a needle breaks, parts of the broken needle may enter your eyes and injury may result.

Turn off the power switch at the following times, otherwise the machine may operate if the treadle is depressed by mistake, which could result in injury.

- When threading the needle
- When replacing the needle and bobbin
- When not using the machine and when leaving the machine unattended

If using a work table which has casters, the casters should be secured in such a way so that they cannot move.

Attach all safety devices before using the sewing machine. If the machine is used without these devices attached, injury may result.

Do not touch any of the moving parts or press any objects against the machine while sewing, as this may result in personal injury or damage to the machine.

Do not touch the motor cover during operation and for one hour after operation has finished, otherwise burns may result.

If an error occurs in machine operation, or if abnormal noises or smells are noticed, immediately turn off the power switch. Then contact your nearest Brother dealer or a qualified technician.

If the machine develops a problem, contact your nearest Brother dealer or a qualified technician.

Cleaning

Turn off the power switch before carrying out cleaning, otherwise the machine may operate if the treadle is depressed by mistake, which could result in injury.

Be sure to wear protective goggles and gloves when handling the lubricating oil and grease, so that they do not get into your eyes or onto your skin, otherwise inflammation can result.
Furthermore, do not drink the oil or eat the grease under any circumstances, as they can cause vomiting and diarrhoea.
Keep the oil out of the reach of children.

Maintenance and inspection

Maintenance and inspection of the sewing machine should only be carried out by a qualified technician.

Ask your Brother dealer or a qualified electrician to carry out any maintenance and inspection of the electrical system.

Turn off the power switch and disconnect the power cord from the wall outlet at the following times, otherwise the machine may operate if the treadle is depressed by mistake, which could result in injury.

- When carrying out inspection, adjustment and maintenance
- When replacing consumable parts such as the rotary hook

Turn off the power switch before inserting or removing the plug, otherwise damage to the control box could result.

If the power switch needs to be left on when carrying out some adjustment, be extremely careful to observe all safety precautions.

Use both hands to hold the machine head when tilting it back or returning it to its original position. If only one hand is used, the weight of the machine head may cause your hand to slip, and your hand may get caught.

Use only the proper replacement parts as specified by Brother.

If any safety devices have been removed, be absolutely sure to re-install them to their original positions and check that they operate correctly before using the machine.

Any problems in machine operation which result from unauthorized modifications to the machine will not be covered by the warranty.

3. Warning labels

The following warning labels appear on the sewing machine.
Please follow the instructions on the labels at all times when using the machine. If the labels have been removed or are difficult to read, please contact your nearest Brother dealer.

1

⚠危険	⚠危险		
高電圧部分にふれて、大けがをすることがある。電源を切り、5分たってからカバーをはずすこと。	触摸高压电部分，会导致受伤。在切断电源5分钟后，再开启盖罩。		
⚠DANGER	**⚠GEFAHR**	**⚠DANGER**	**⚠PELIGRO**
Hazardous voltage will cause injury. Turn off main switch and wait 5minutes before opening this cover.	Hochspannung verletzungsgefahr! Bitte schalten sie den hauptschalter aus und warten sie 5 minuten, bevor sie diese abdeckung öffnen.	Un voltage non adapte provoque des blessures. Eteindre l'interrupteur et attendre 5 minutes avant d'ouvrir le capot.	Un voltaje inadecuado puede provocar las heridas.Apagar el interruptor principal y esperar 5 minutos antes de abrir esta cubierta.

2

⚠注意
動く部分でけがをする。安全保護装置をつけて、縫製作業をすること。 電源を切ってから、糸通し、ボビンや針の交換、掃除や調整をすること。
⚠ CAUTION
Moving parts may cause injury. Operate with safety devices. Turn off main switch before threading, changing bobbin and needle,cleaning etc.

3 Be sure to connect the ground. If the ground connection is not secure, you run a high risk of receiving a serious electric shock, and problems with correct operation may also occur.

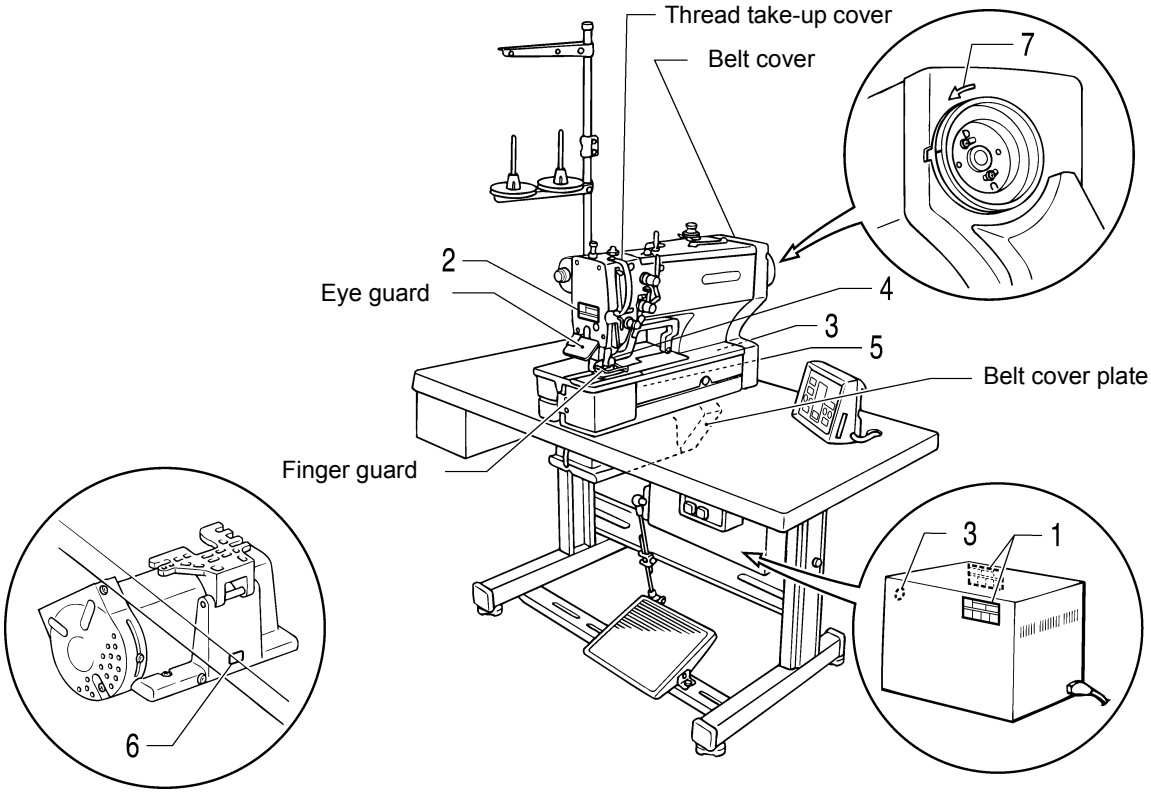
4 Do not touch any of the cutter or press any objects against the machine while sewing, as this may result in personal injury or damage to the machine.

5 Do not touch any of the fan or press any objects against the machine, as this may result in personal injury or damage to the machine.

Safety devices
- Eye guard
- Finger guard
- Thread take-up cover
- Belt cover
- Belt cover plate, etc.

6 High temperature warning display

7 Direction of operation



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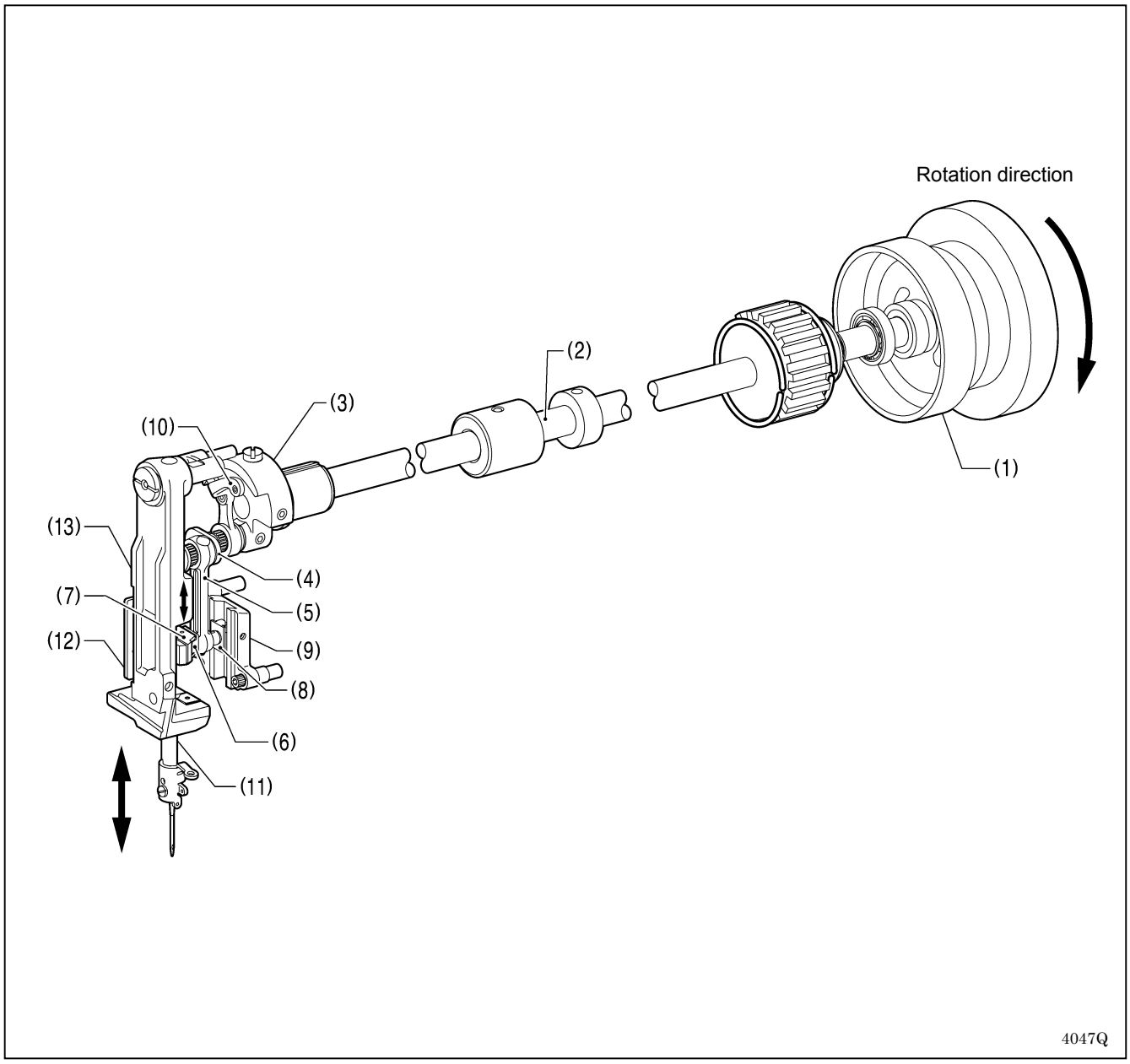
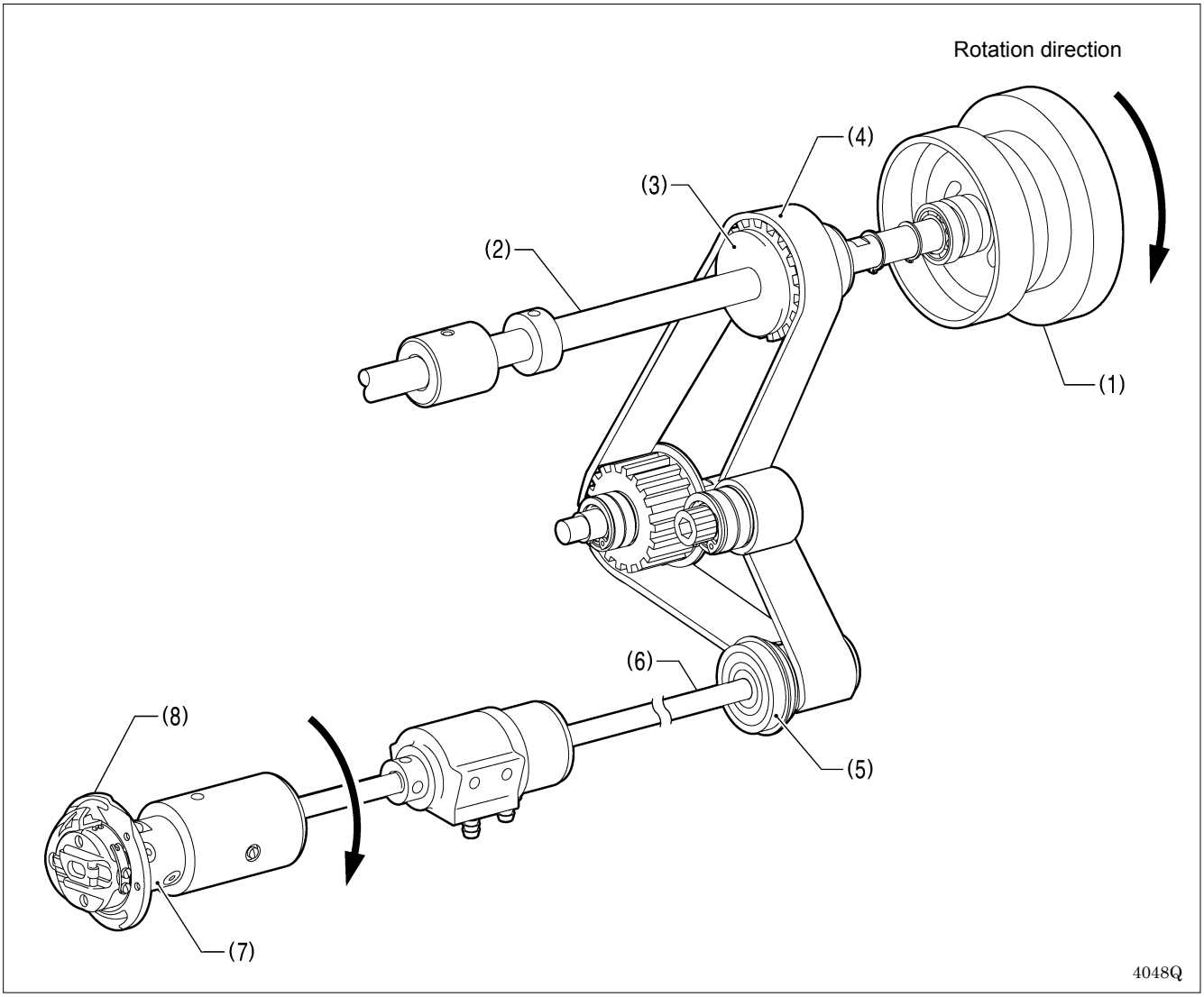
1. MECHANICAL DESCRIPTIONS

1-1. Needle bar and thread take-up mechanisms



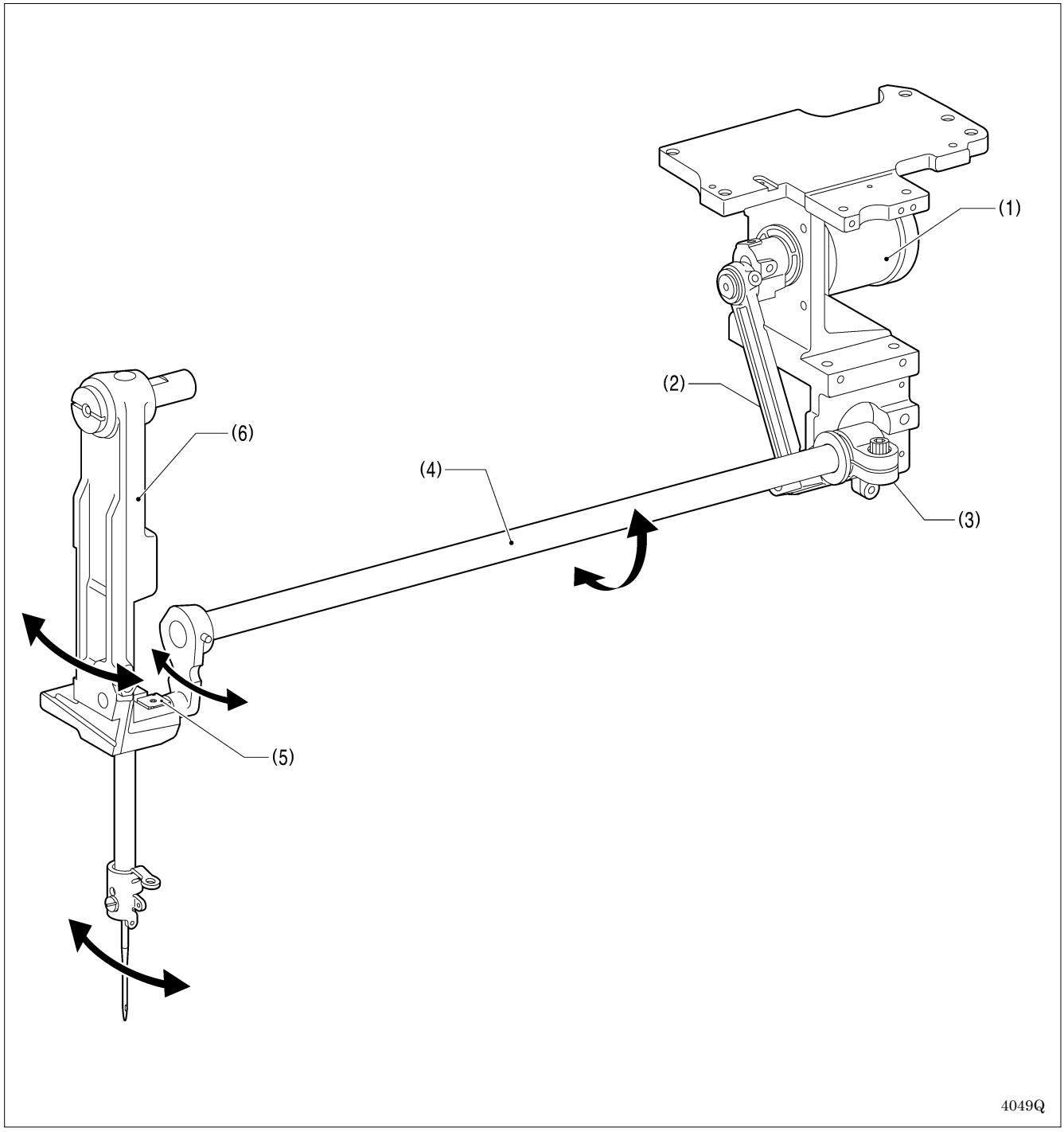
1. When the machine pulley (1) is turned in the direction of the arrow, the rotation is transmitted to the thread take-up crank (3) that is secured to the end of the upper shaft (2).
2. The needle bar crank (4) is secured to the thread take-up crank (3), and it transmits vertical motion to the needle bar clamp (7) via the needle bar crank rod (5) and needle bar bracket slide rod (6).
   At this time, the needle bar crank rod (5) moves together with the crank rod guide (9) via the needle bar bracket slide rod (8).
3. Elliptical motion is transferred to the thread hole of the thread take-up (10) via the needle bar crank (4).
4. The needle bar (11) is secured to the needle bar clamp (7), and it moves smoothly up and down while being guided by the bushings at the top and bottom of the needle bar guide (12) and needle bar bracket (13).

1-2. Upper shaft, lower shaft and rotary hook mechanisms



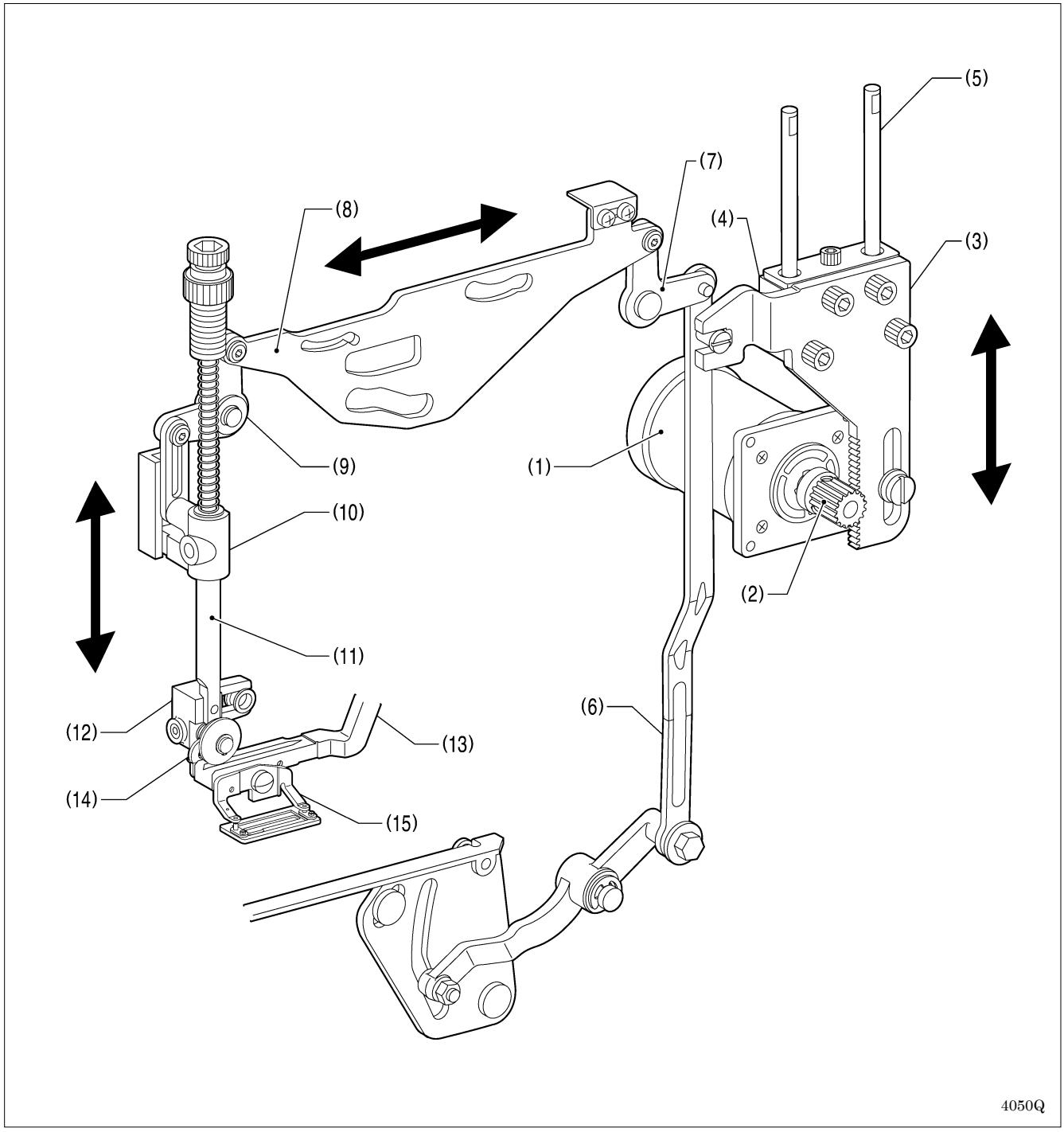
1. When the machine pulley (1) is turned in the direction of the arrow, the rotation is transmitted to timing pulley U (3) that is secured to the upper shaft (2).
2. The timing belt (4) is attached to timing pulley U (3), and it accurately transmits the rotation of the upper shaft to the timing pulley (5).
3. The timing pulley (5) is secured to the lower shaft (6), and it transmits the rotation to the rotary hook joint (7) that is secured to the end of the lower shaft (6).
4. The rotary hook (8) is secured to the rotary hook joint (7) and rotates fully together with the rotary hook joint (7).

1-3. Needle zigzag mechanism



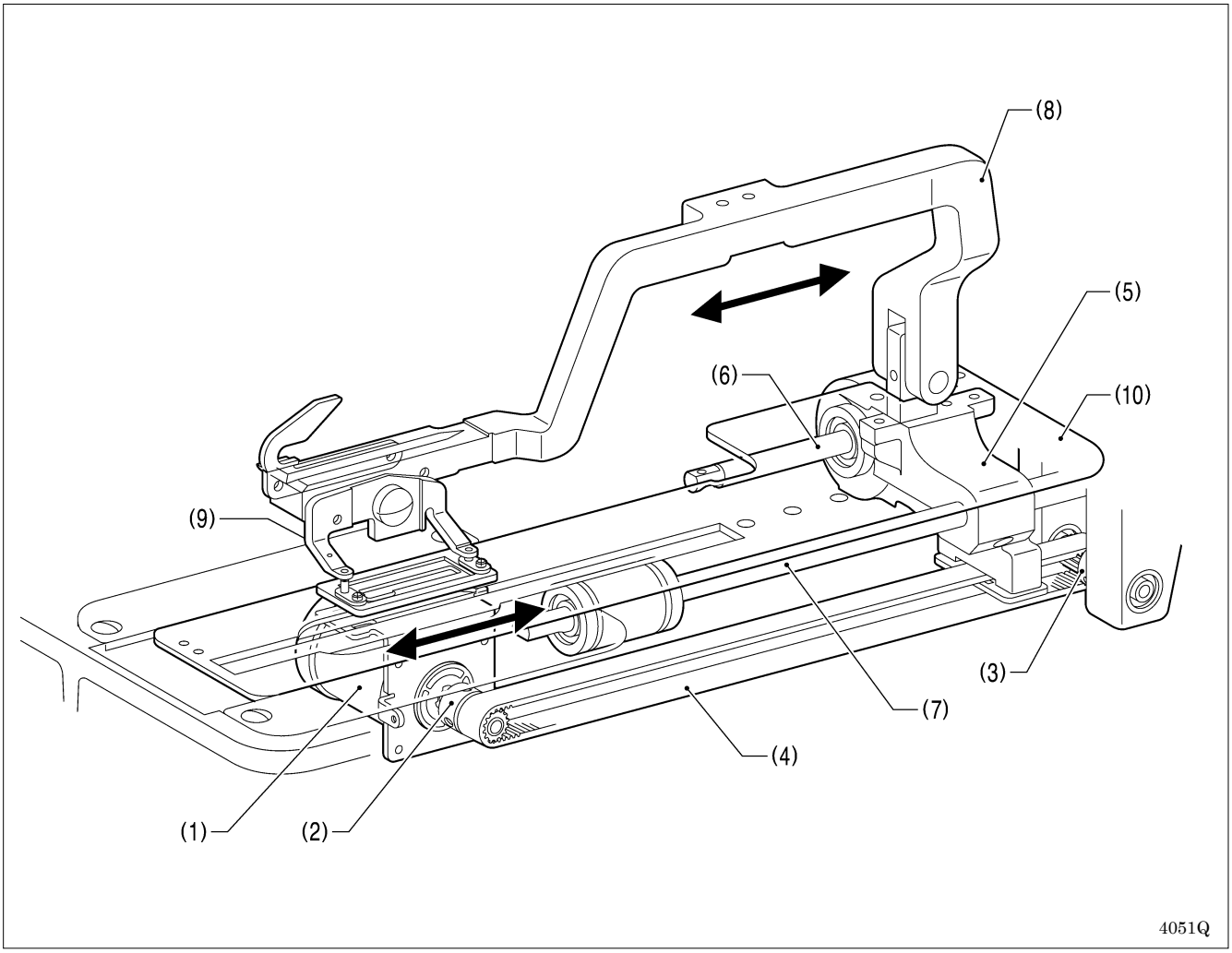
1. The operation of the pulse motor (1) is transmitted as reciprocal motion to the zigzag lever (3) via the zigzag connection rod (2).
2. The zigzag lever (3) is secured to the zigzag lever F assembly (4), and causes the needle bar bracket slide block (5) that is linked onto the end of the zigzag lever F assembly (4) to move in a reciprocal motion.
3. The needle bar bracket slide block (5) is linked to the groove in the needle bar bracket (6) and causes the needle bar bracket (6) to move in a reciprocal motion.

1-4. Presser foot lifter mechanism



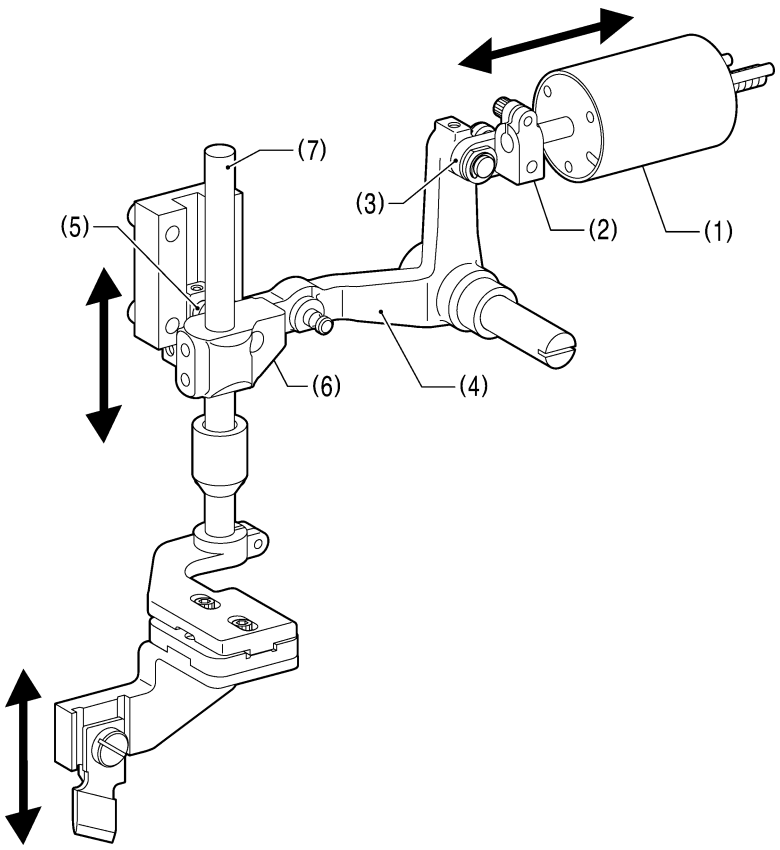
1. When the pulse motor (1) operates, the gear (2) that is installed to the pulse motor shaft engages with the presser driving arm (3) so that the guide bracket (4) moves along the guide shaft (5) and moves the presser driving arm (3) up and down.
2. The presser driving arm (3) causes the presser foot lifter connecting rod (6) to move up and down.
3. The movement of the presser foot lifter connecting rod (6) is transmitted via the knee lifter lever (7), upper thread trimmer driving link (8) and knee lifter lever (9) to move the presser bar guide bracket assembly (10) up and down.
4. The feed arm (11) is secured to the presser bar guide bracket assembly (10), and it moves the presser roller bracket (12) that is secured to the bottom edge of the feed arm (11) up and down.
5. Feed arm support (14) that is connected to the feed arm (13) is hooked onto the presser roller bracket (12), and it moves the work clamp (15) up and down.

1-5. Feed mechanism



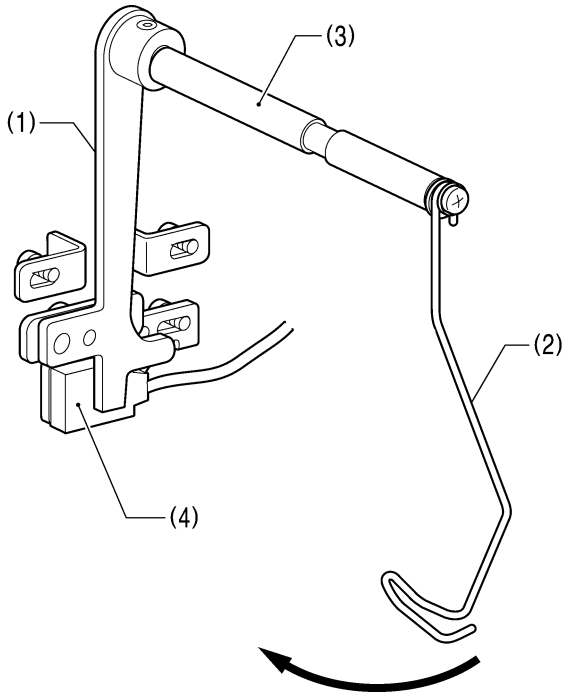
1. A timing belt (4) is attached to pulley A (2) that is secured to the pulse motor (1) and to pulley B (3), and this timing belt (4) transmits the motion from the pulse motor (1).
2. The feed arm support (5) is secured to the timing belt (4). The feed arm support (5) moves back and forth while being guided by feed guide shaft A (6) and feed guide shaft B (7).
3. The feed arm (8) is connected to the feed arm support (5), and it moves the work clamp (9) that is installed to the feed arm (8) and the length feed plate (10) that is installed to the feed arm support (5) back and forth.

1-6. Cutter mechanism



1. When a cutter ON signal is input, the cutter solenoid (1) operates.
2. A cutter link bracket (2) is secured to the end of the plunger, and it turns the cutter driving arm (4) via the cutter driving link (3).
3. The cutter driving kink (5) that is secured to the end of the cutter driving arm (4) is moved up and down.
4. The driving shaft holder assembly (6) is linked to the cutter driving link (5), and this causes the cutter driving shaft (7) that is connected to the driving shaft holder assembly (6) to move up and down.

1-7. Thread breakage detection mechanism



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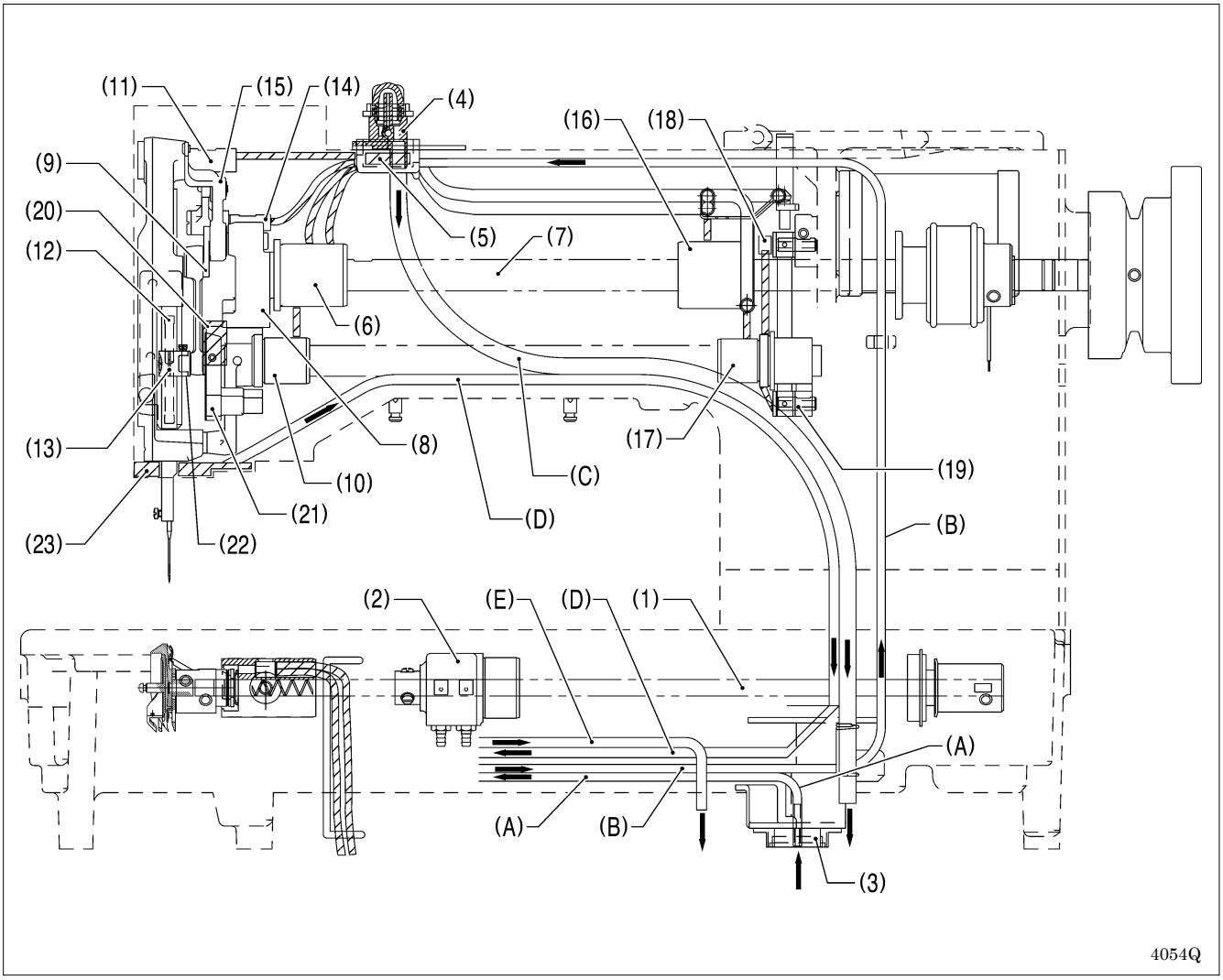
1. The cutter bar fixed plate assembly (1) and the thread guide (2) are secure to the thread breakage perceiving shaft (3). When a thread breakage occurs, the cutter bar fixed plate assembly (1) drop by its own weight and moves the thread guide (2) in the direction of the arrow.
2. When the sensor (4) detects the cutter bar fixed plate assembly (1), the sewing machine stops and the cutter is prevented from dropping.

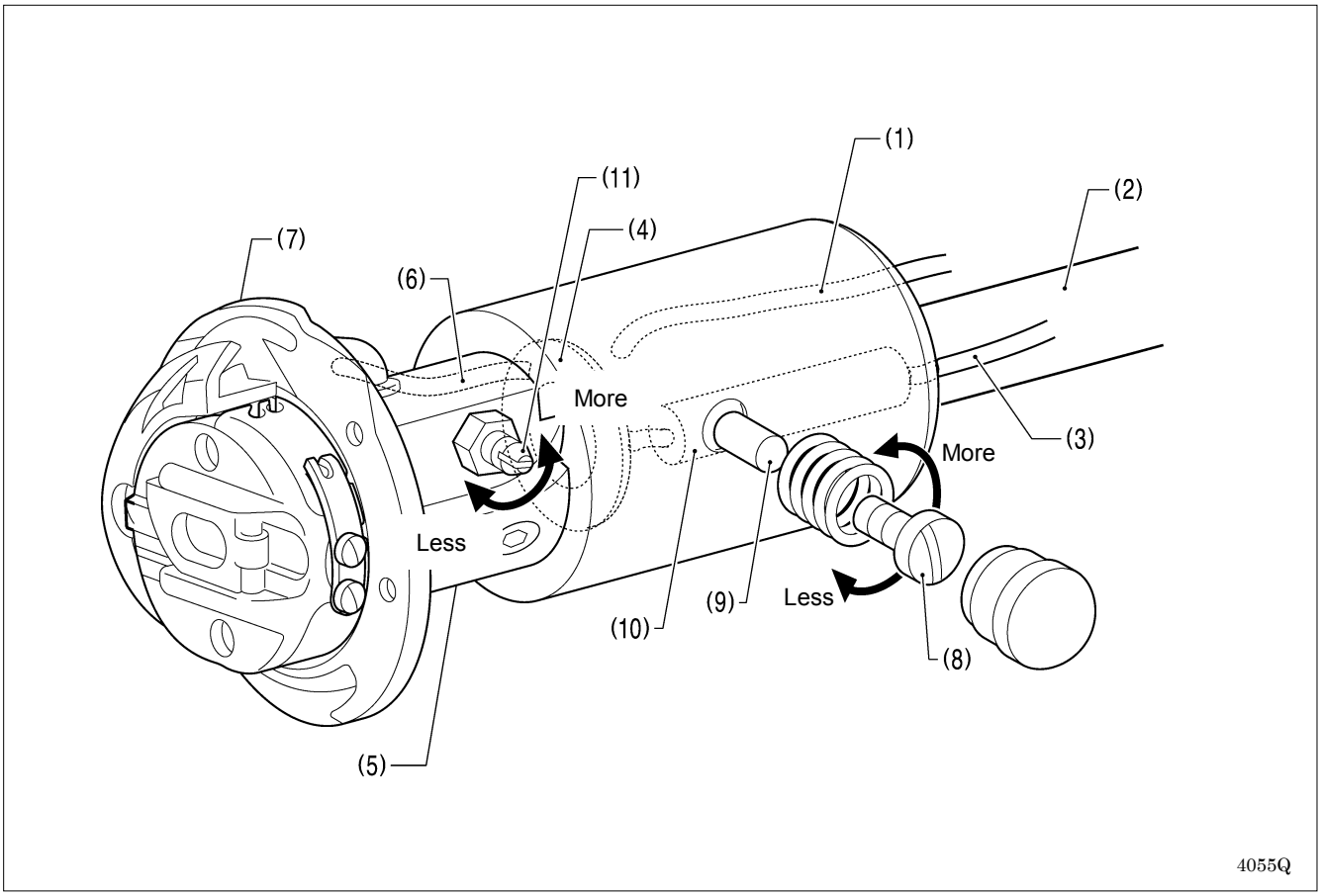
1-8. Lubrication mechanism



1. The plunger pump (2) that is attached to the lower shaft (1) draws oil up (A) through the pump filter (3) and sends the oil (B) to the oil terminal (4), where the wick lubricates the felt (5).
2. The oil is transferred from the felt (5) by means of the wick to the following places.
   1) Oil is supplied to bush F (6), and it passes through the upper shaft (7) and thread take-up crank (8) to the needle bar crank (9). Furthermore, oil is supplied from bush F (6) to zigzag lever bush F (10).
   2) Oil is supplied from the needle bar bracket support shaft (11) to the needle bar (12), and from there it is supplied to parts such as the needle bar clamp (13).
   3) Oil is supplied from the support shaft (14) to the thread take-up (15).
   4) Oil is supplied to bush M (16).
   5) Oil is supplied to zigzag lever bush R (17).
   6) Oil is supplied to the motor lever shaft (18), and from there it is supplied to the zigzag connecting rod shaft (19).

   Oil which splatters inside the arm is collected by the felt (20) and is supplied to the crank rod guide (21) and to the slide block (22).)
3. The oil which is sent to the oil terminal (4) is returned to the oil tank via the oil return tube (C).
4. The oil which collects in the jaw of the arm, is absorbed by the felt (23) and is drawn up by the plunger pump (2) through the tube (D), and it is then returned to the oil tank (E) by the plunger pump (2).

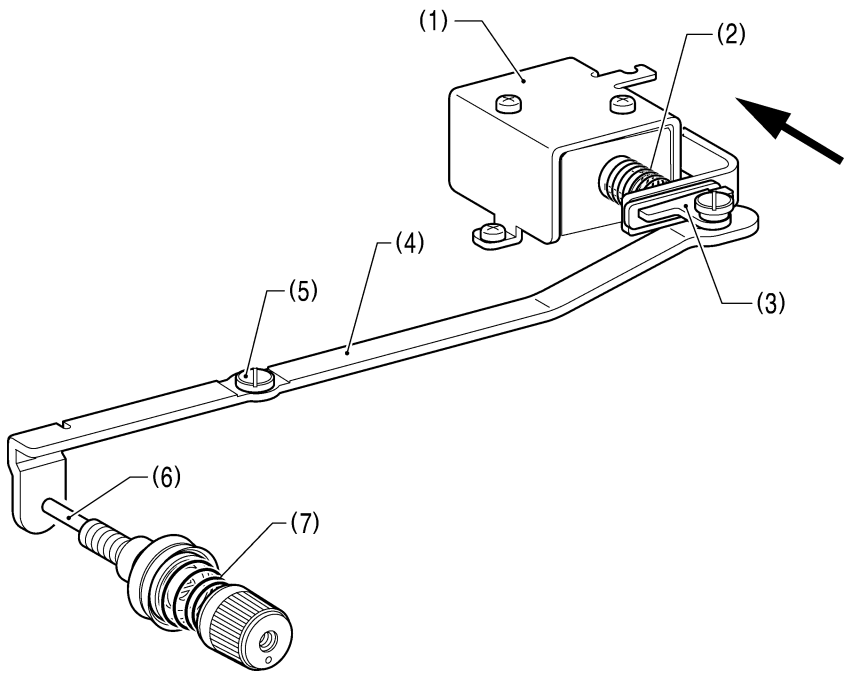
1-8-1. Lower shaft and rotary hook lubrication



1. The oil which is drawn up by the wick (1) is supplied to the lower shaft (2).
2. The oil which is drawn up by the wick (3) passes through the felt (4) and the rotary hook joint (5) to the felt (6), where it is supplied to the rotary hook (7).
3. The oil that is supplied to the rotary hook (7) can be adjusted by turning the screw (8) to vary the amount by which the rubber presser (9) presses down on the collar (10) that the wick passes through.

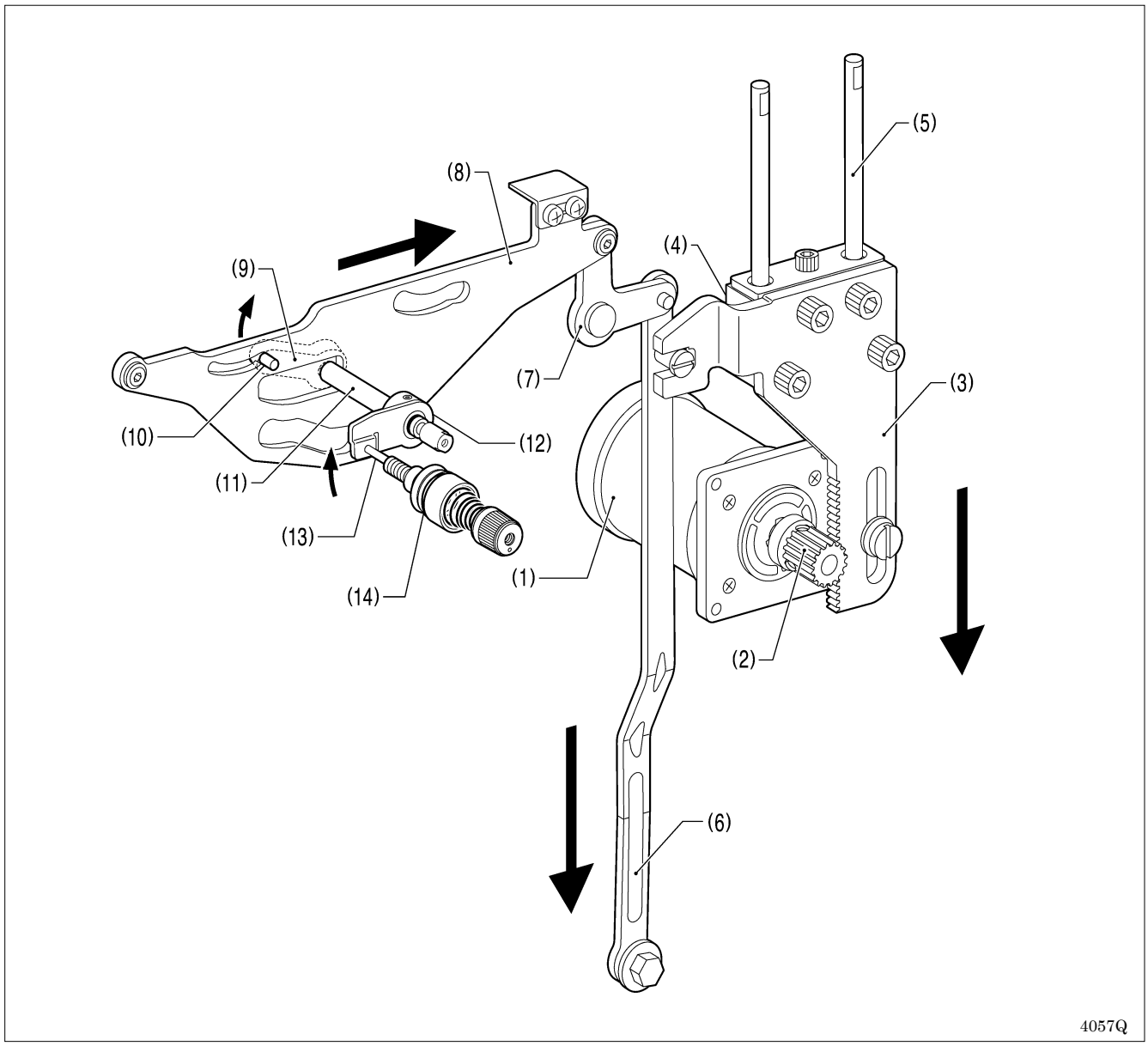
1-9. Tension release mechanism

[Zigzag tension control]



1. When a thread tension ON signal is input, the tension release solenoid (1) operates.
2. The plunger (2) moves in the direction of the arrow, and the movement is transmitted to the tension release solenoid link (3) that is connected to the plunger (2).
3. The tension release link (4) that is connected to the tension release solenoid link (3) operates with the shoulder screw (5) as a pivot and presses against the tension release pin (6).
4. The tension release pin (6) presses against the tension disc presser (7) to release the tension discs.

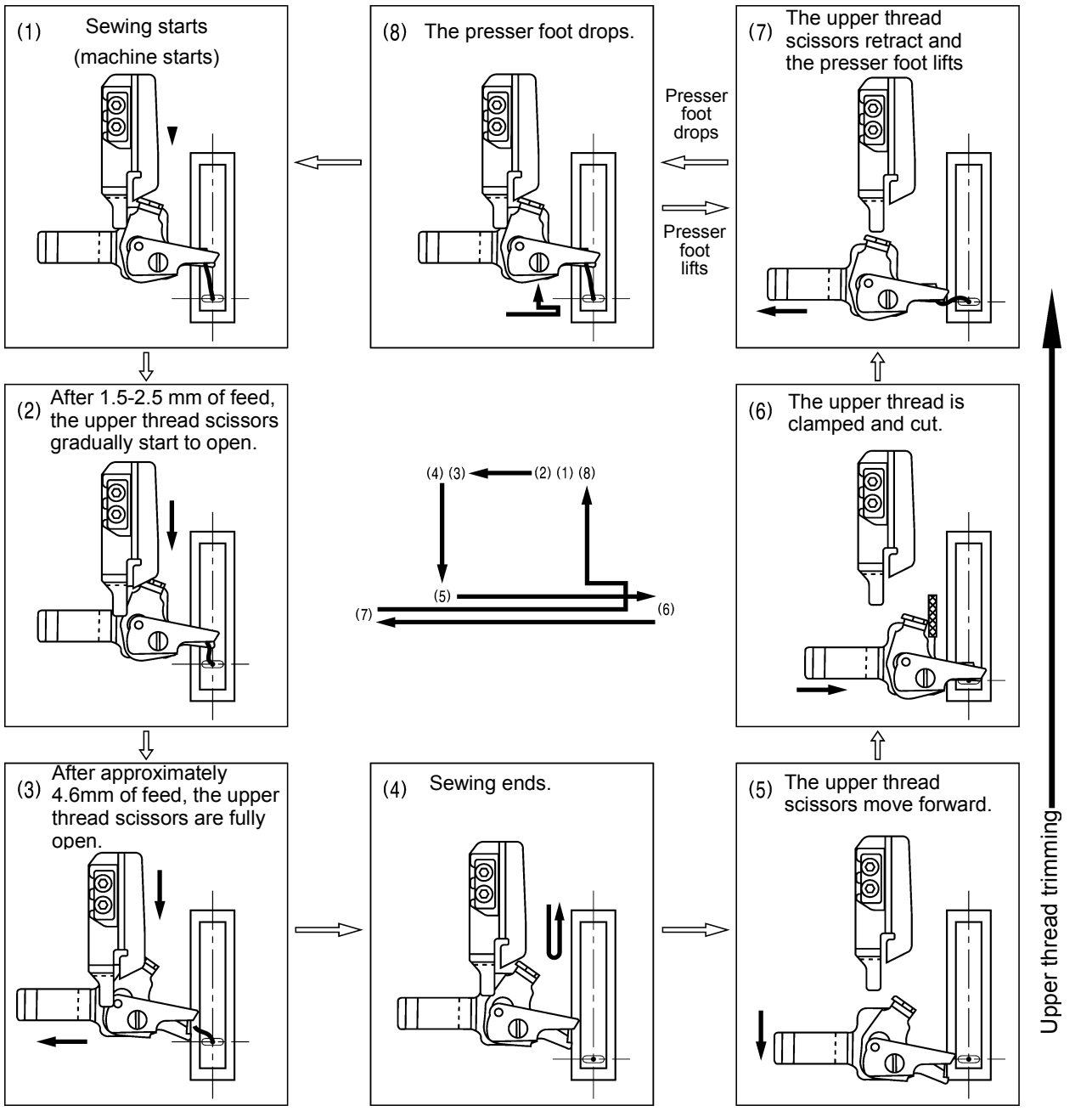
[Tack tension control]



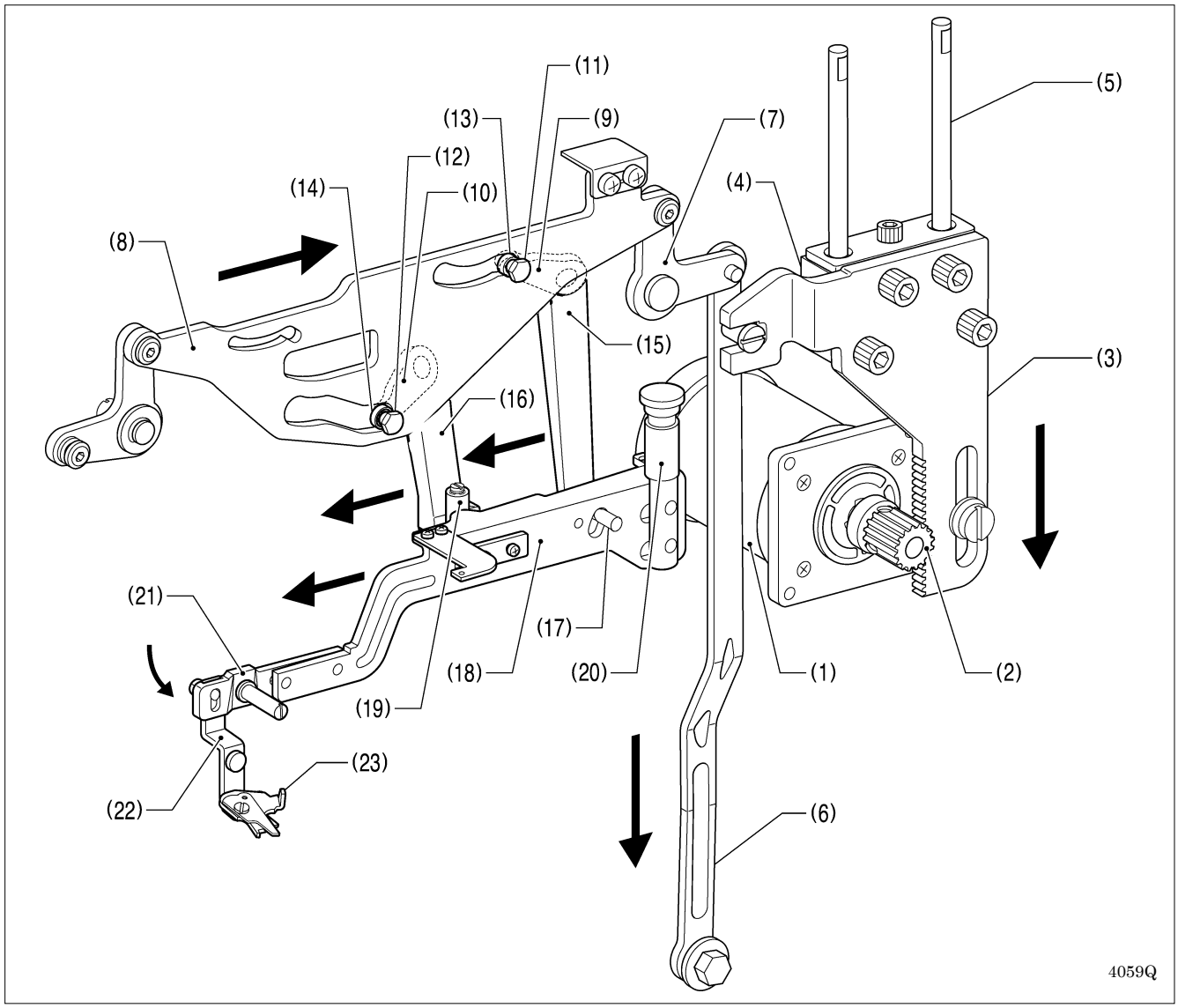
1. When the pulse motor (1) operates, the gear (2) that is installed to the pulse motor shaft engages with the presser driving arm (3) so that the guide bracket (4) moves along the guide shaft (5) and moves the presser driving arm (3) in the direction of the arrow.
2. The presser driving arm (3) causes the presser foot lifter connecting rod (6) to move in the direction of the arrow.
3. The movement of the presser foot lifter connecting rod (6) is transmitted via the knee lifter lever (7) to move the upper thread trimmer driving link (8) in the direction of the arrow.
4. The needle roller (10) that is secured to the end of the tension release driving lever (9) is linked to the cam groove of the upper thread trimmer driving link (8), so that when the upper thread trimmer driving link (8) operates, the tension release driving lever (9) that is secured to the tension release shaft (11) moves in the direction of the arrow.
5. The tension release cam (12) is secured to the end of the tension release shaft (11), and so the tension release cam (12) moves in the direction of the arrow.
6. When the tension release cam (12) presses against the tension release pin (13), the tension release pin (13) presses against the tension disc presser (14) to release the tension discs.

1-10. Upper thread trimmer mechanism

Upper thread trimmer mechanism operating sequence

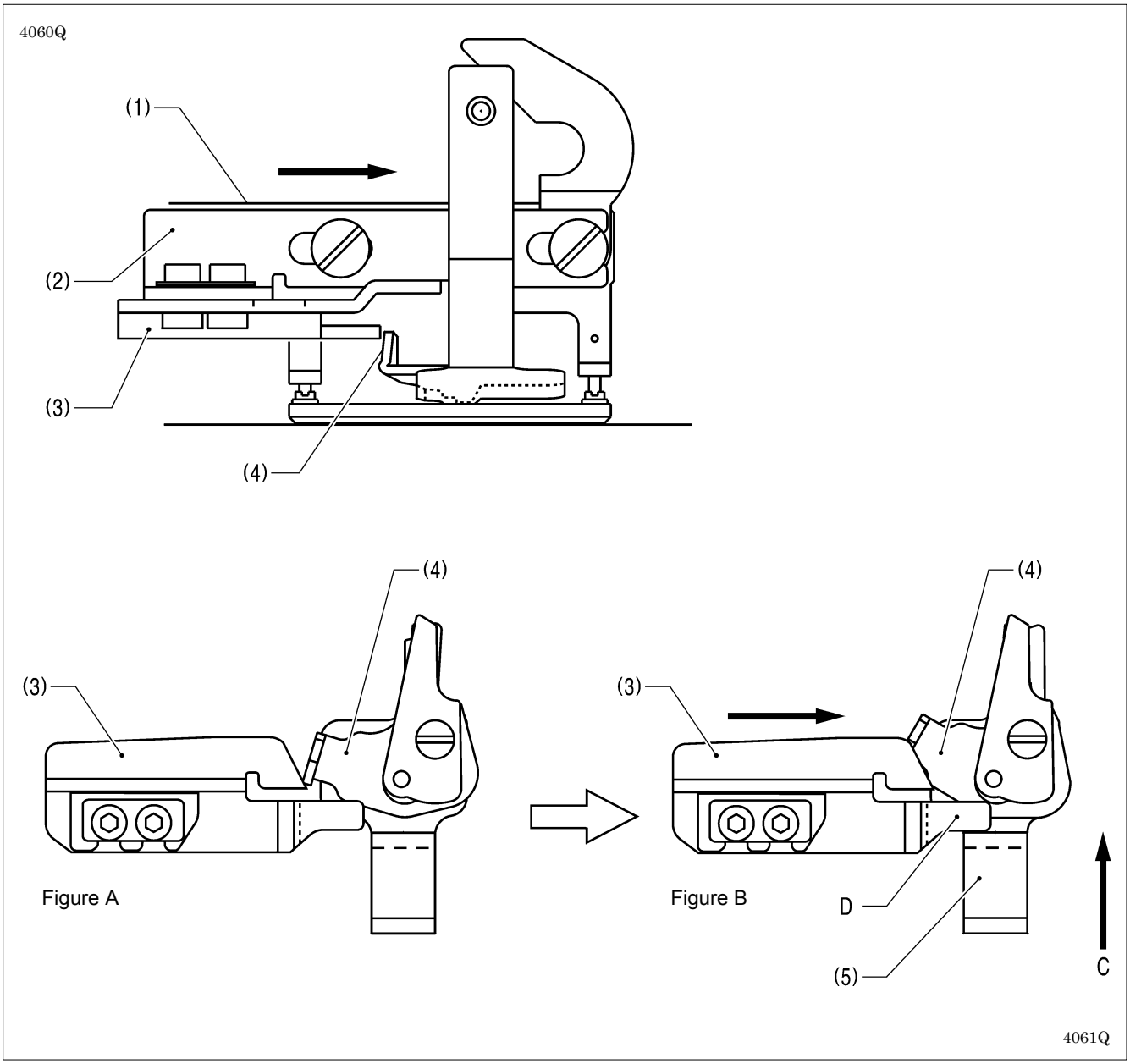

(1) Sewing starts (machine starts)
(8) The presser foot drops.
(7) The upper thread scissors retract and the presser foot lifts
Presser foot drops
Presser foot lifts
(2) After 1.5-2.5 mm of feed, the upper thread scissors gradually start to open.
(4) (3) (2) (1) (8)
(5)
(7)
(6)
(6) The upper thread is clamped and cut.
(3) After approximately 4.6mm of feed, the upper thread scissors are fully open.
(4) Sewing ends.
(5) The upper thread scissors move forward.
Upper thread trimming

4058Q



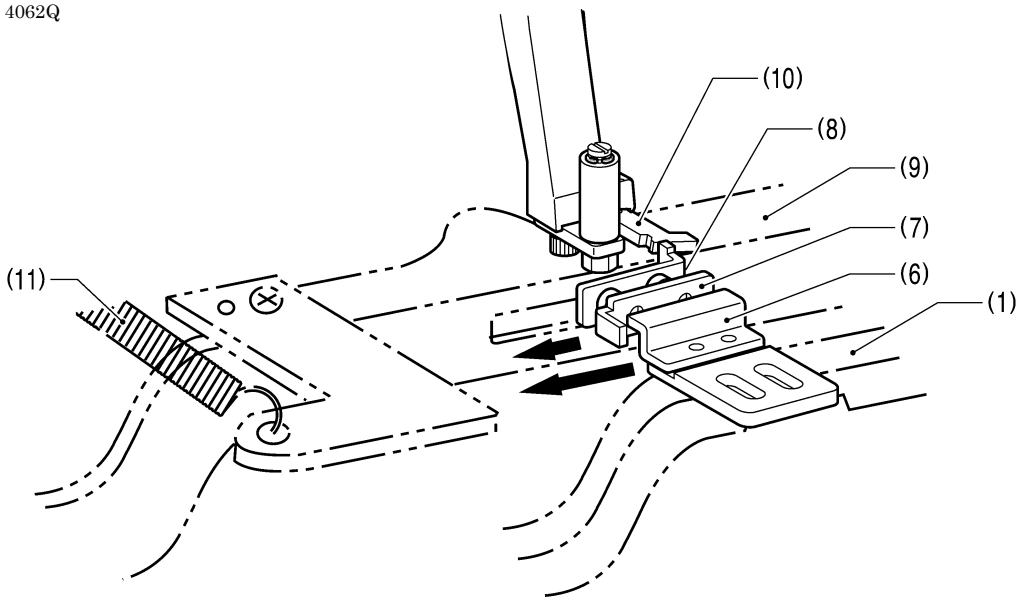
1. When the pulse motor (1) operates, the gear (2) that is installed to the pulse motor shaft engages with the presser driving arm (3) so that the guide bracket (4) moves along the guide shaft (5) and moves the presser driving arm (3) in the direction of the arrow.
2. The presser driving arm (3) causes the presser foot lifter connecting rod (6) to move in the direction of the arrow.
3. The movement of the presser foot lifter connecting rod (6) is transmitted via the knee lifter lever (7) to move the upper thread trimmer driving link (8) in the direction of the arrow.
4. The driving lever roller (13) and ball bearing (14) that are installed to the ends of the trimmer driving levers (9) and (10) by the shoulder screws (11) and (12) are linked to the cam groove in the upper thread trimmer driving link (8) so that when the upper thread trimmer driving link (8) moves in the direction of the arrow, the trimmer driving levers (9) and (10) operate.
5. When the trimmer driving levers (9) and (10) operate, the longitudinal feed arm (15) and trimmer driving arm (16) that are secured to the trimmer driving levers (9) and (10) move in the direction of the arrow.
6. When the longitudinal feed arm (15) operates, the upper thread trimmer lever (18) that is attached to the longitudinal feed arm roller (17) at the end of the longitudinal feed arm (15) moves back and forth.
7. When the trimmer driving arm (16) operates, the driving arm roller (19) that is installed to the trimmer driving arm (16) rolls along the cam groove in the upper thread trimmer lever (18), and the upper thread trimmer lever (18) rotates centering on the upper thread trimmer fulcrum shaft (20).
8. The setting plate (21) is secured to the end of the upper thread trimmer lever (18), and so the movement is transmitted to the upper thread trimmer assembly (22) that is secured to the setting plate (21).
9. Upper thread trimmer M (23) that is installed to the upper thread trimmer assembly (22) comes into contact with the work clamp, so that upper thread trimmer M (23) closes and cuts the thread.

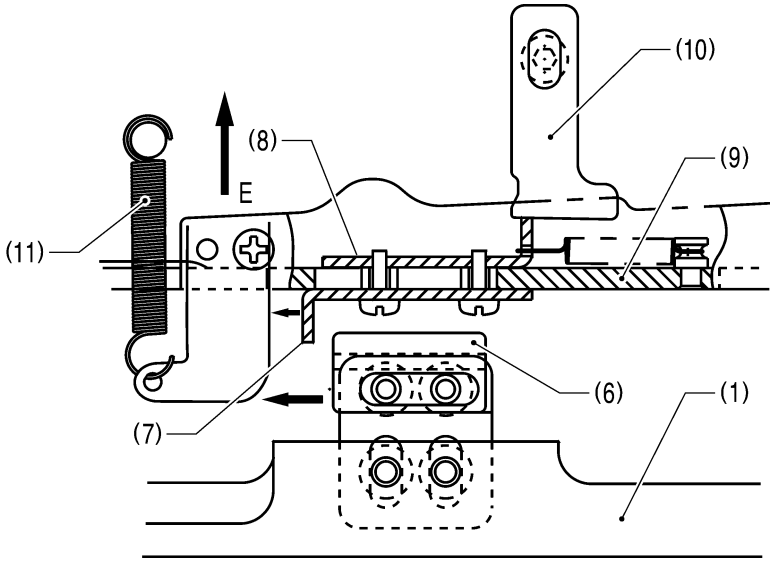
1-10-1. Upper thread scissors



1. An opening cam (3) is attached to the opening cam bracket (2) that is secured to the feed arm (1) (Figure A). After sewing starts, the feed arm (1) moves in the direction of the arrow (forward).
2. When upper thread trimmer M (4) touches against the ridge line on the opening cam (3), the upper thread trimmer gradually starts to open (Figure B). At this time, section D of the opening cam (3) fits into the upper thread trimmer assembly (5) so that the upper thread trimmer assembly (5) cannot move in the direction of arrow C.

4062Q





4063Q

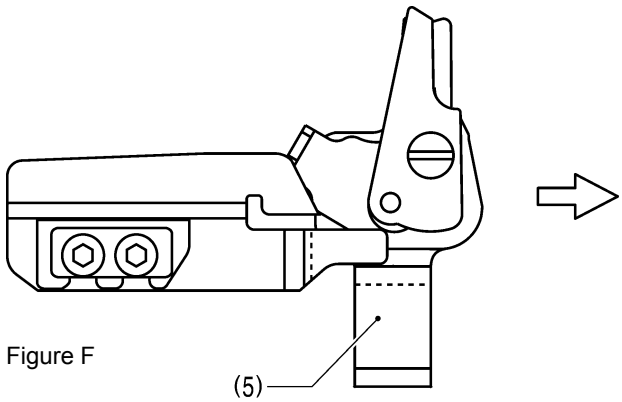


Figure F

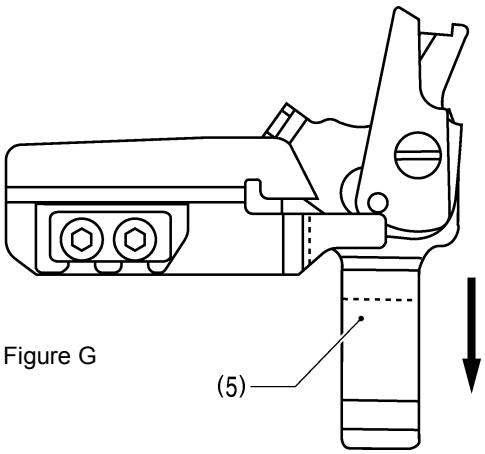
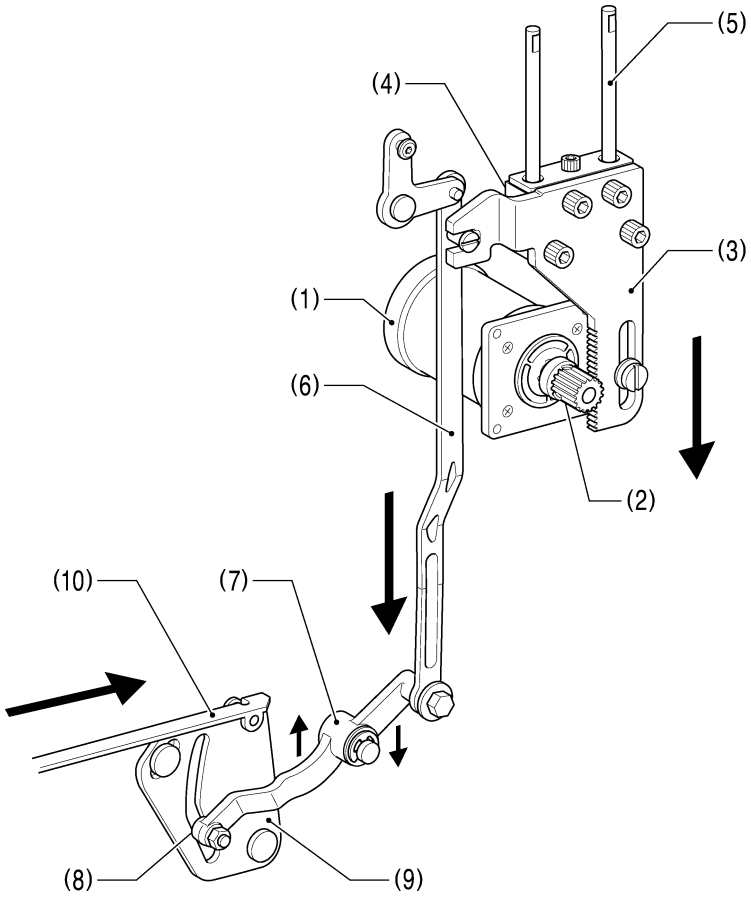


Figure G

4064Q

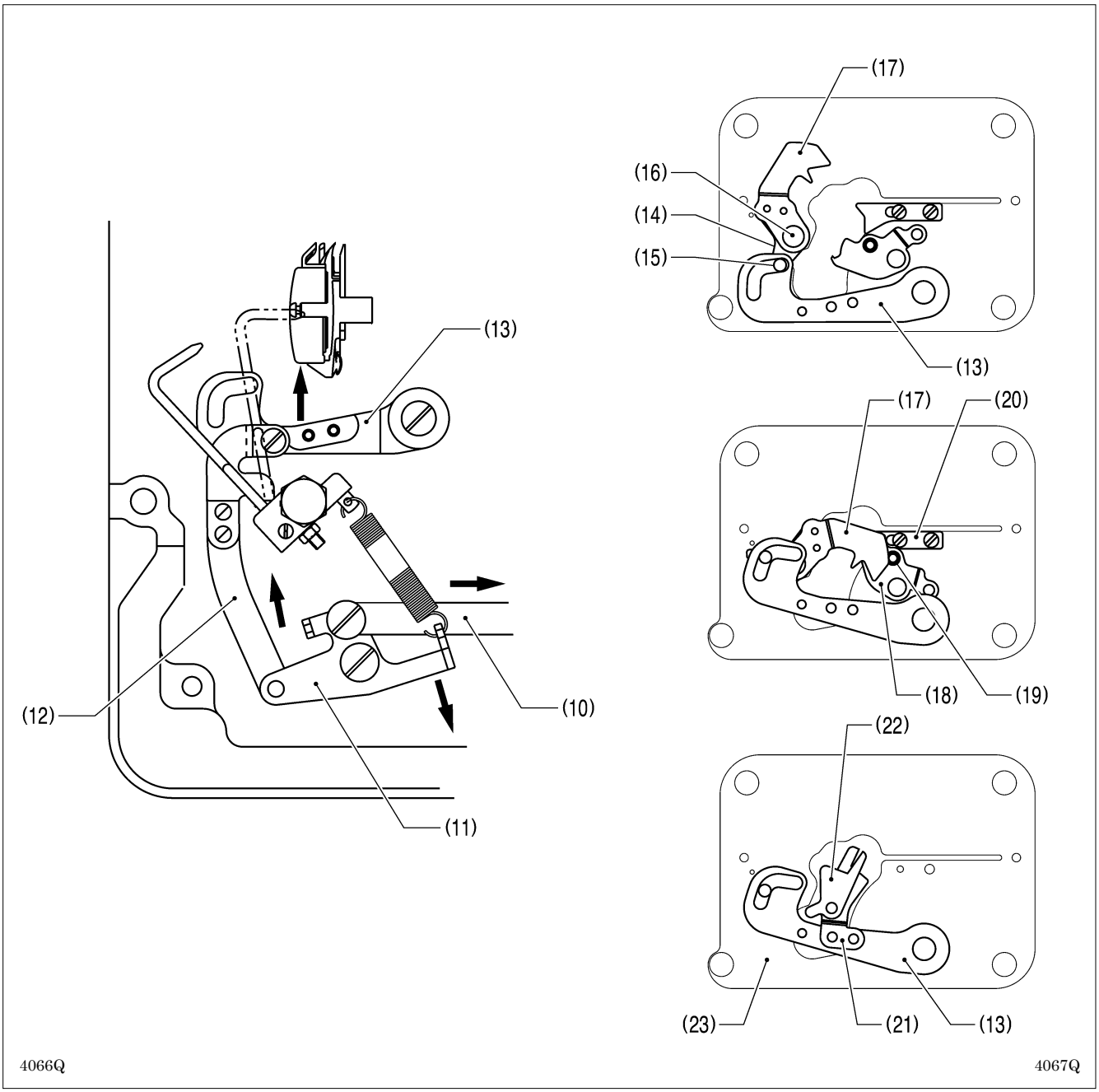
3. Then, when the feed mechanism moves forward, the cam (6) that is secured to the feed arm (1) moves in the direction of the arrow (forward) and moves the back plate (7) in the direction of the arrow (forward).
4. When the back plate (7) and the stop plate (8) lock together and clamp the upper thread trimmer lever (9) and the stop plate (8) separates from the back stopper (10), the upper thread trimmer lever (9) is pulled in the direction of arrow E by the spring (11), and the upper thread trimmer assembly (5) changes from the condition in Figure F to the one in Figure G and the upper thread trimmer opens fully.

1-11. Lower thread trimmer mechanism

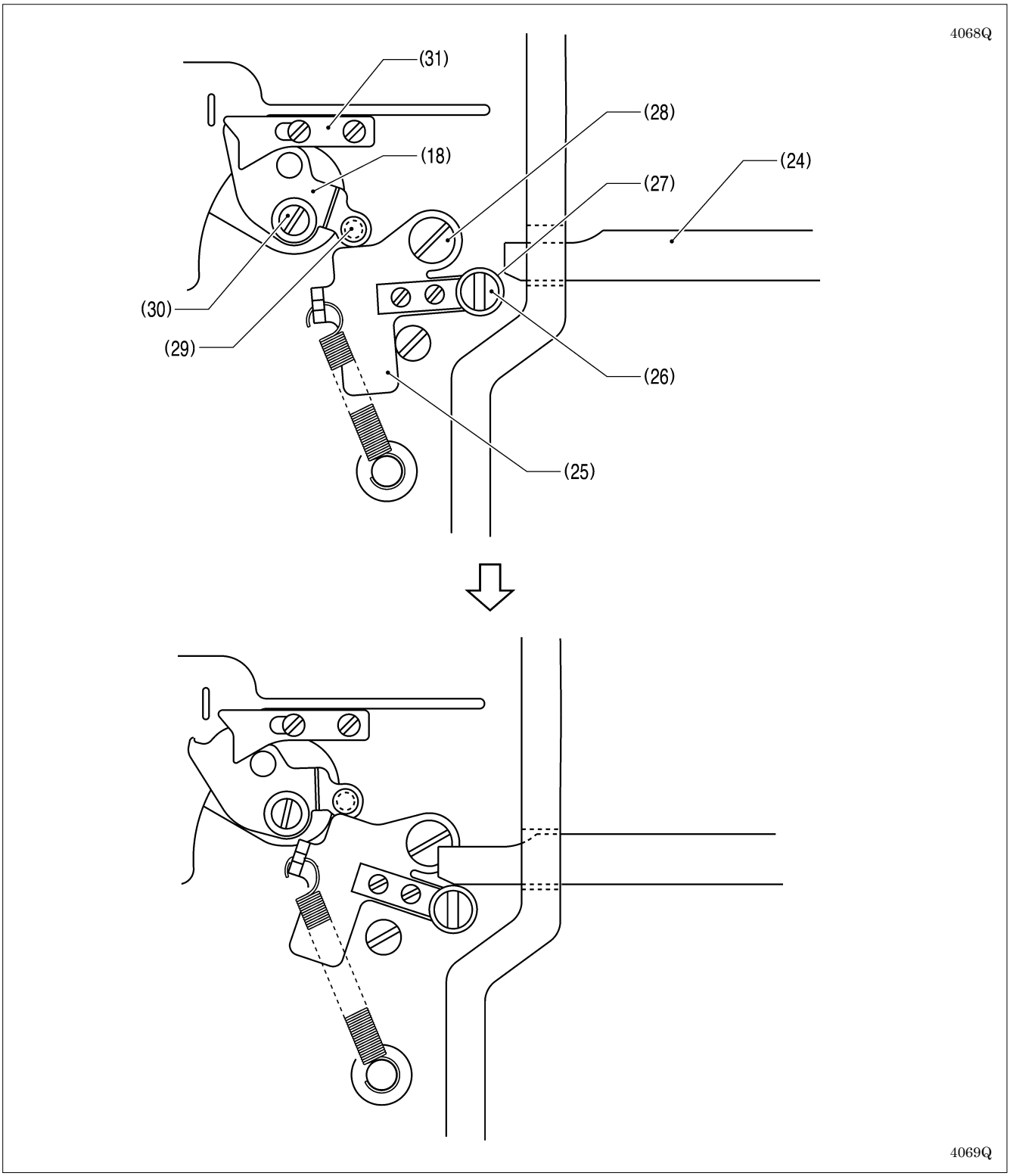


4065Q

1. When the pulse motor (1) operates, the gear (2) that is installed to the pulse motor shaft engages with the presser driving arm (3) so that the guide bracket (4) moves along the guide shaft (5) and moves the presser driving arm (3) in the direction of the arrow.
2. The presser driving arm (3) causes the presser foot lifter connecting rod (6) to move in the direction of the arrow.
3. The presser foot lifter connecting rod (6) is connected to the lower thread trimmer cam lever (7), so that the lower thread trimmer cam lever (7) moves.
4. The roller (8) that is installed to the end of the lower thread trimmer cam lever (7) is linked to the cam groove in the lower thread trimmer cam (9), so that when the lower thread trimmer cam lever (7) operates, the lower thread trimmer cam (9) moves with it and the movement is transmitted to the lower thread trimmer cam connecting rod (10) that is connected to the lower thread trimmer cam (9).



5. The lower thread trimmer cam connecting rod (10) is connected to lower thread trimmer link A (11), so that the movement of the lower thread trimmer cam connecting rod (10) is transmitted via lower thread trimmer link A (11) and the lower thread trimmer connecting rod (12) to the knife driving lever (13).
6. The collar (15) that is installed to the lever (14) is linked to the cam groove in the knife driving lever (13), so that when the knife driving lever (13) operates, the lever (14) rotates centering on the screw (16).
7. The lower thread retainer (17) is secured to the lever (14), so the lower thread retainer (17) starts to operate.
8. When the lower thread retainer (17) operates, the collar (19) that is installed to the lower thread clamp plate (18) moves over the ridge line of the cam of the lower thread retainer (17), and the lower thread clamp plate (18) starts to close and engages with the lower thread presser (20) so that the lower thread is clamped.
9. The lower thread retainer (17) then continues operating.
10. The fixed knife (21) is secured to the knife driving lever (13), so that when the knife driving lever (13) operates, the cam section of the movable knife (22) that is secured to the fixed knife (21) moves over the cam section of the base plate (23) so that the movable knife (22) starts to close. When the lower thread retainer (17) has finished operating, the movable knife (22) meshes fully with the fixed knife (21) and cuts the lower thread.



11.When feed guide shaft B (24) that is secured to the feed arm support moves forward after sewing starts, the roller (27) that is secured to the opening plate (25) by means of the roller shaft (26) moves over feed guide shaft B (24) and the opening plate (25) rotates centering on the shoulder screw (28).

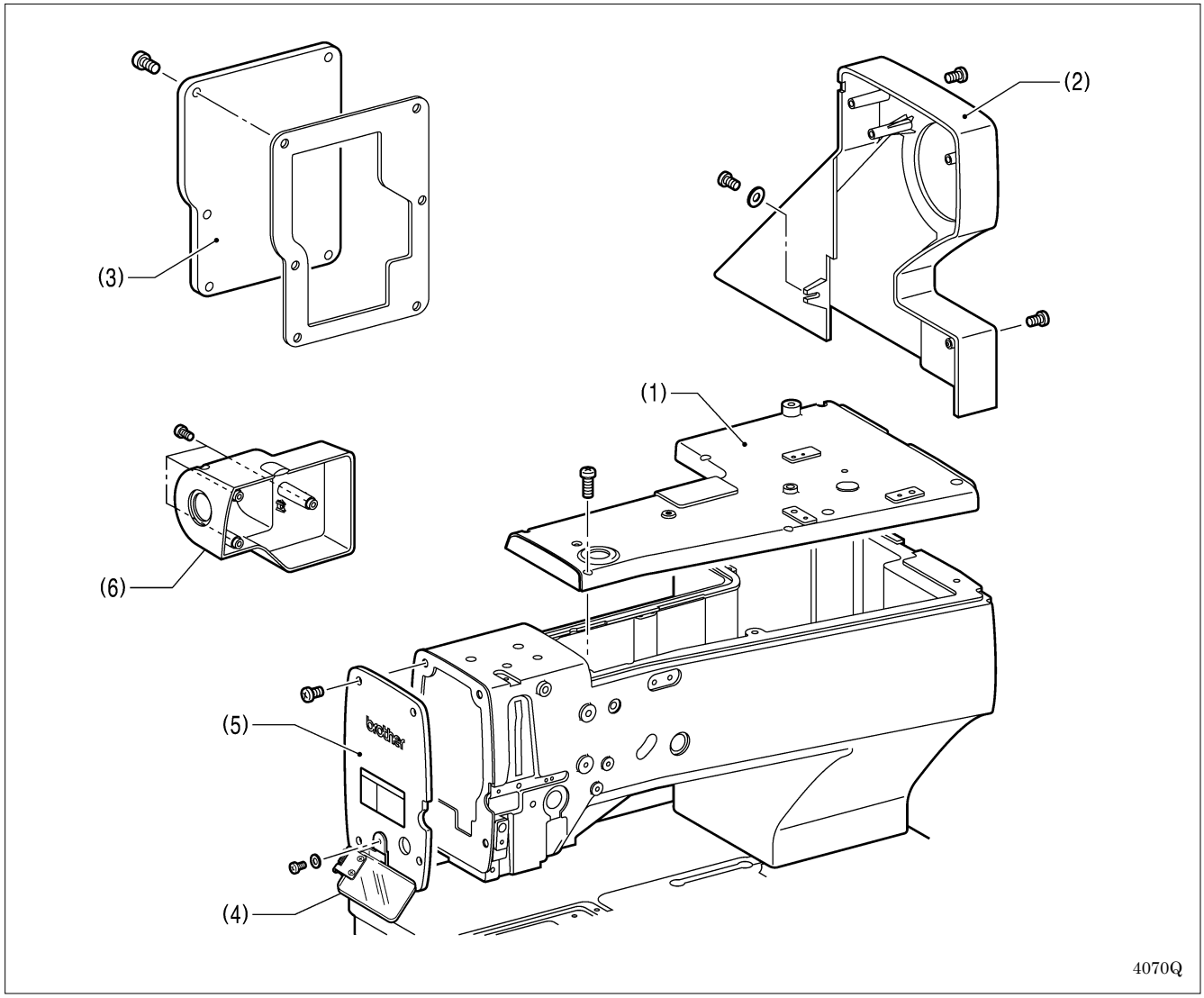
12.The opening plate (25) presses against the collar (24) that is installed to the lower thread clamp plate (18) and the lower thread clamp plate (18) rotates centering on the shoulder screw (30), so that the clamped lower thread is released by the lower thread presser (31) and the lower thread clamp plate (18).

2. DISASSEMBLY

⚠ CAUTION

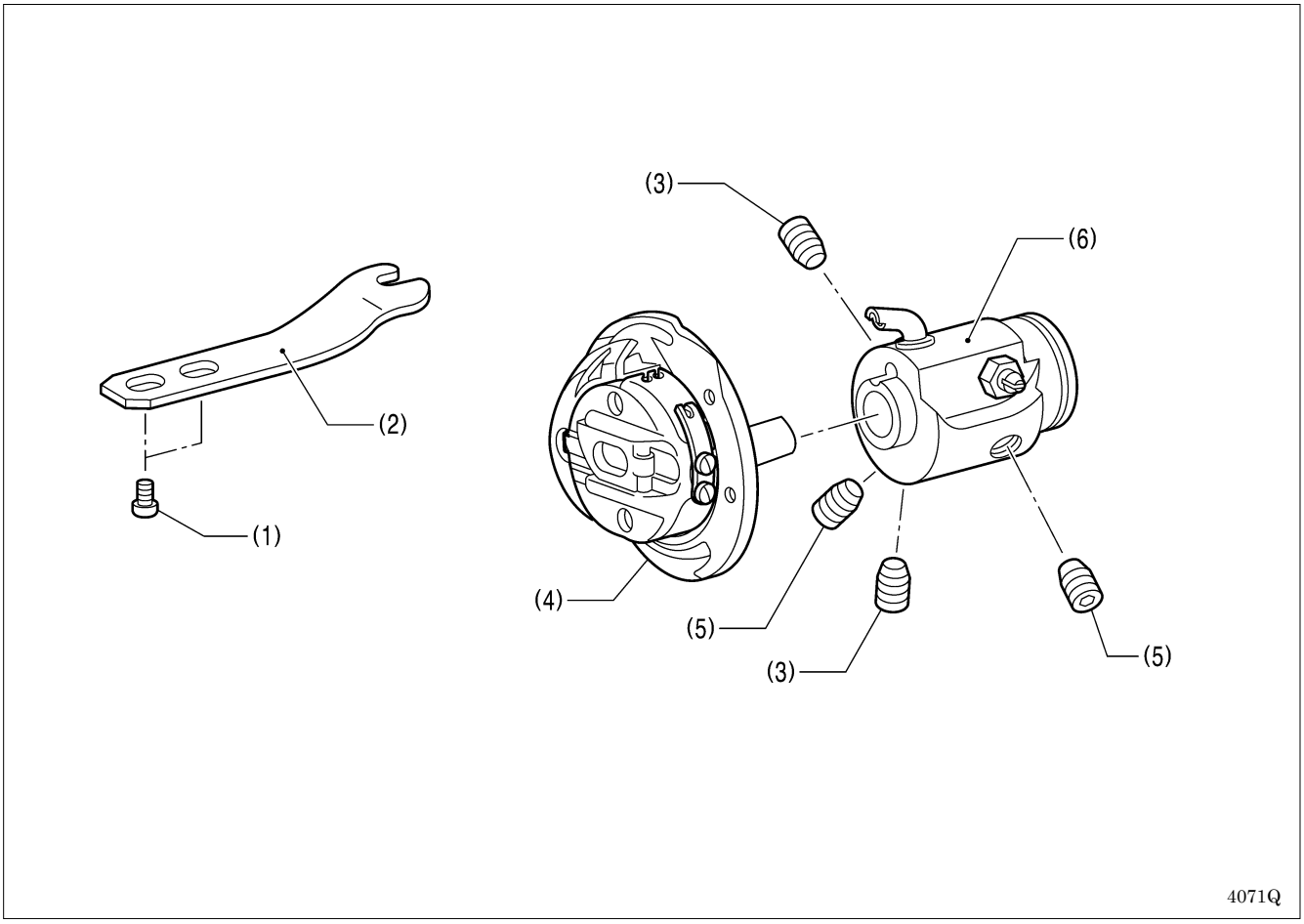
- Disassembly should only be carried out by a qualified technician.
- Turn off the power switch before disassembly, otherwise the machine may operate if the treadle is depressed by mistake, which could result in injury.
- Be sure to wear protective goggles and gloves when handling the lubricating oil and grease, so that they do not get into your eyes or onto your skin, otherwise inflammation can result.
  Furthermore, do not drink the oil or eat the grease under any circumstances, as they can cause vomiting and diarrhea.
  Keep the oil out of the reach of children.
- Use only the proper replacement parts as specified by Brother.
- If any safety devices have been removed, be absolutely sure to re-install them to their original positions and check that they operate correctly before using the machine.
- Any problems in machine operation which result from unauthorized modifications to the machine will not be covered by the warranty.

2-1. Covers



1. Remove the top cover (1), the belt cover (2) and the rear cover (3).
2. Remove the eye guard assembly (4), the face plate (5) and the cover (6).

2-2. Rotary hook mechanism

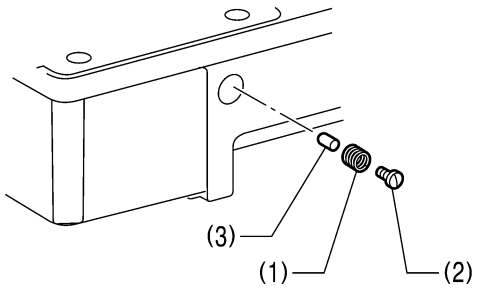


1. Remove the two screws (1), and then remove the rotary hook holder (2).
2. Loosen the two set screws (3), and then remove the rotary hook (4).
3. Loosen the two set screws (5), and then remove the rotary hook joint assembly (6) from the lower shaft.

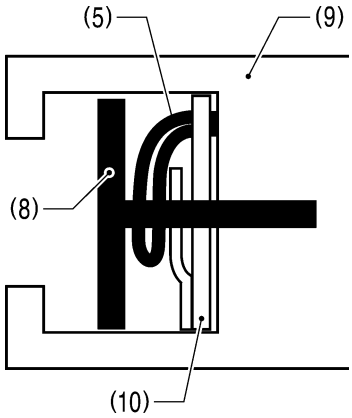
2-3. Lubrication mechanism (1)

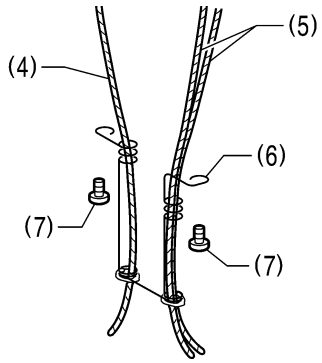
2-3-1. Rotary hook lubricating mechanism

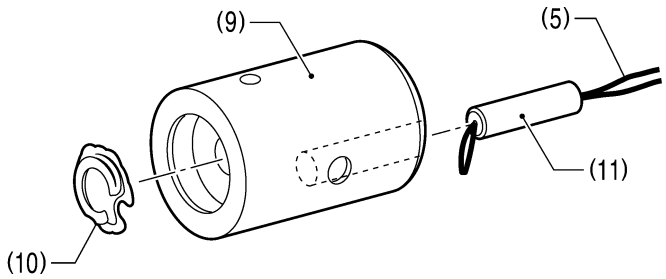
4072Q



4073Q





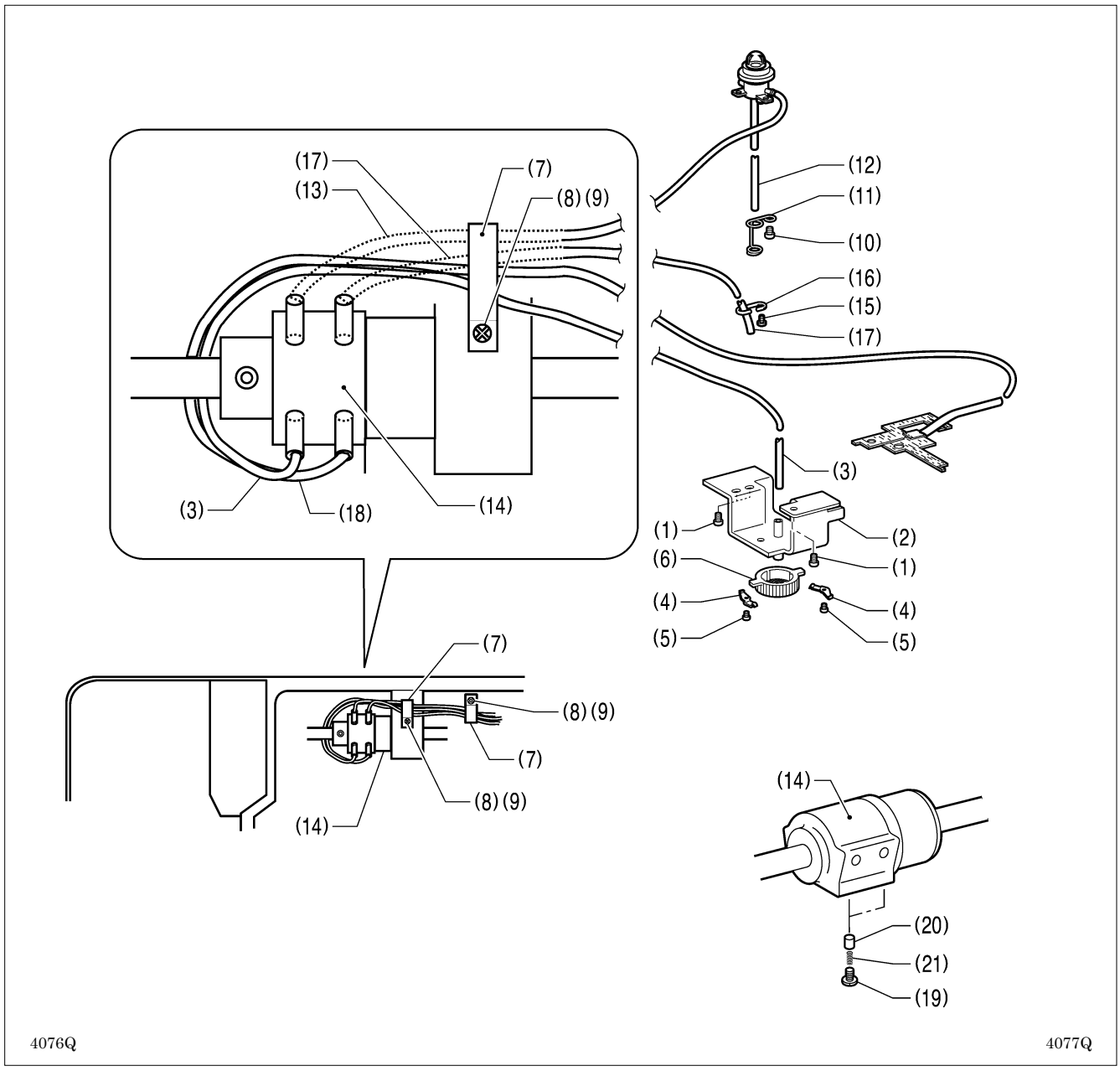


4074Q

4075Q

1. Remove the spring (1) and the screw (2), and then remove the rubber presser (3) from the bed.
2. Remove the wicks (4) and (5) from the felt support (6).
3. Remove the two screws (7), and then remove the felt support (6) from the bed.
4. Remove the end of the felt (8) from the bush (9).
5. Remove the spring (10) and the collar (11) from the bush (9).
6. Remove the wick (5) from the collar (11).

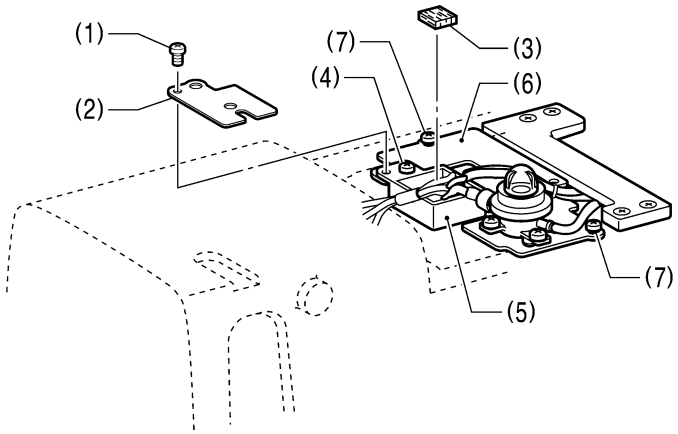
2-3-2. Plunger pump mechanism

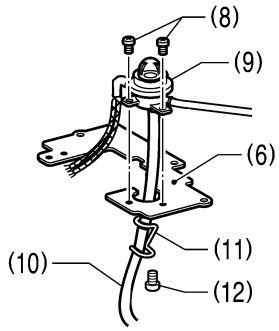


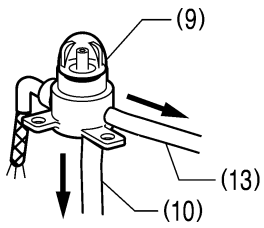
1. Remove the three screws (1), and then remove the oil filter bracket (2) from the bed.
2. Remove the oil tube (3) that is connected between the plunger and the filter from the oil filter bracket (2).
3. Remove the two springs (4) and the two screws (5), and then remove the pump filter (6) from the oil filter bracket (2).
4. Remove the two cord holders (7), screws (8) and plain washers (9).
5. Remove the screw (10), and then remove the tube support D (11) from the oil tube (12) that is connected between the oil terminal and the oil outlet and from the bed.
6. Remove the oil tube (13) that is connected between the oil terminal and the plunger pump from the lubricating hole to the left of bush M (14).
7. Remove the screw (15), and then remove the tube support (16) from the oil tube (17) and from the bed.
8. Remove the outlet oil tube (17) from the lubricating hole to the right of bush M (14).
9. Remove the oil tube (3) that is connected between the plunger and the filter from the inlet hole to the left of bush M (14).
10. Remove the oil tube (18) from the inlet hole to the right of bush M (14).
11. Remove the two screws (19), and then remove the two plungers (20) and the two compression springs (21) from bush M (14).

2-3-3. Oil terminal mechanism

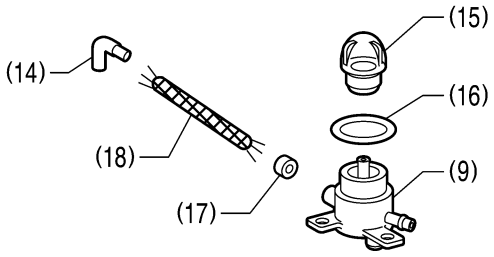
4078Q







4080Q

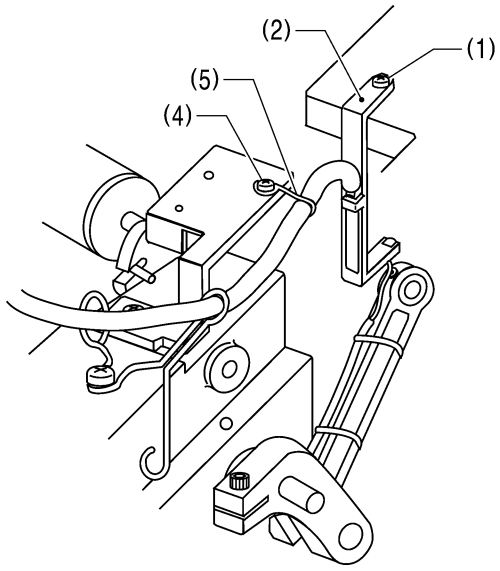


4079Q

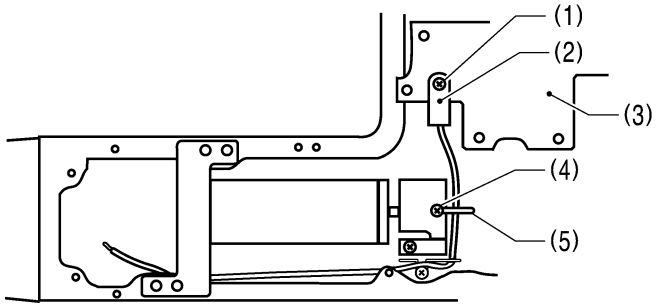
4081Q

1. Remove the screw (1), and then remove the cap (2) and the felt (3).
2. Remove the screw (4), and then remove the felt base A (5) from the wick base support (6).
3. Remove the two screws (7), and then remove the wick base support (6).
4. Remove the two screws (8), and then remove the oil terminal (9) from the wick base support (6).
5. Remove the oil tube (10) that is connected between the oil terminal and the oil outlet from the tube support (11).
6. Remove the screw (12), and then remove the tube support (11) from the wick base support (6).
7. Disconnect the oil tube (10) that is connected between the oil terminal and the oil outlet from the oil terminal (9).
8. Disconnect the oil tube (13) that is connected between the oil terminal and the plunger pump from the oil terminal (9).
9. Remove the oil pipe B (14), the oil cap (15), the packing (16), the collar (17) and the wick (18) from the oil terminal (9).

2-3-4. Needle zigzag mechanism



4082Q

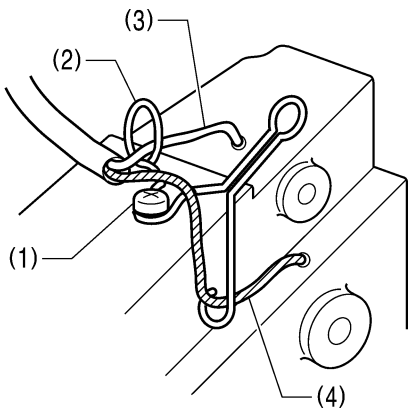


4083Q

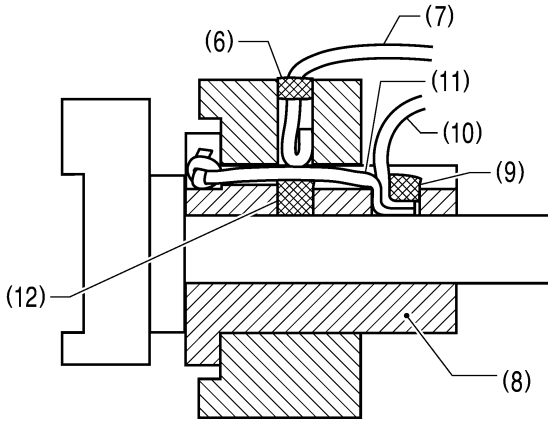
1. Remove the screw (1), and then remove the felt support assembly (2) from the motor bracket (3).
2. Remove the screw (4), and then remove the tube support (5).

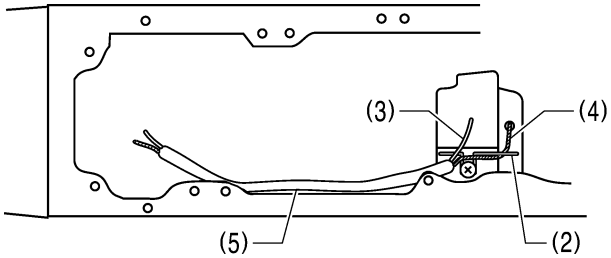
2-3-5. Shaft bush mechanism

4084Q



4086Q



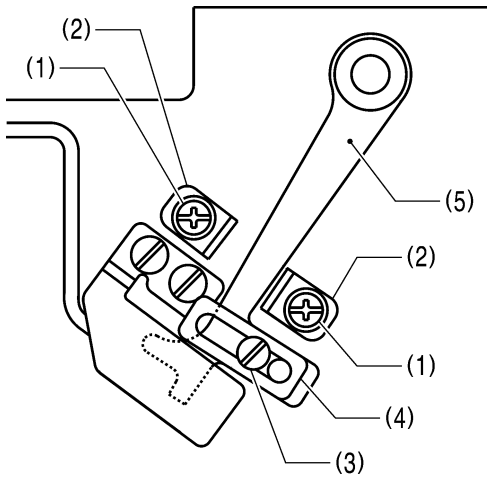


4085Q

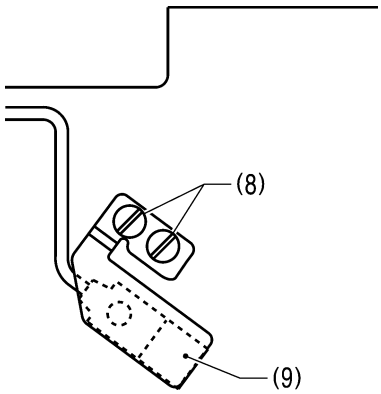
1. Remove the screw (1), and then remove the tube support U (2).
2. Remove the wicks (3) and (4), and then disconnect the oil tube (5).
3. Remove the felt (6), and then remove the wick (7) from the bush F (8).
4. Remove the felt (9), and then remove the wicks (10) and (11) from the bush F (8).
5. Remove the felt (12) from the bush F (8).

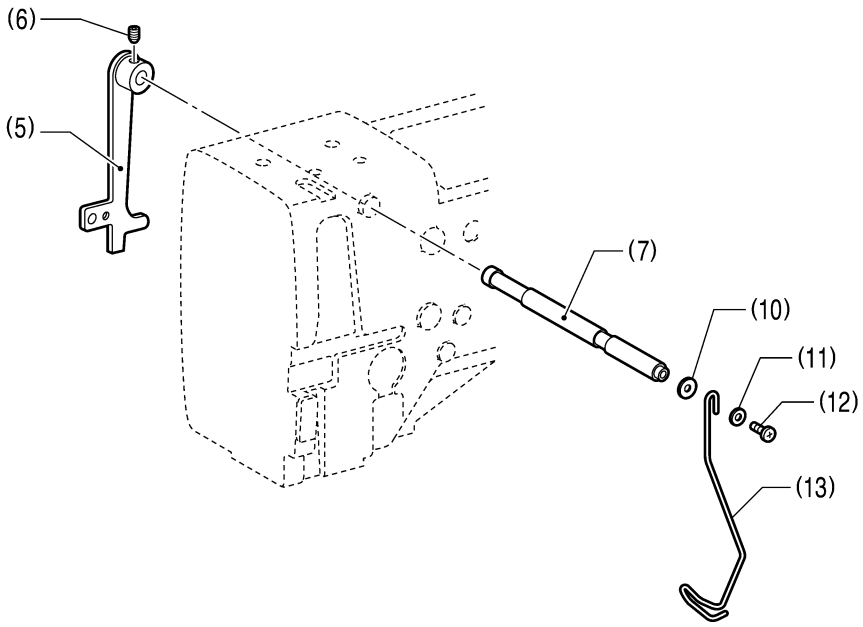
2-4. Thread breakage detection mechanism

4087Q



4088Q

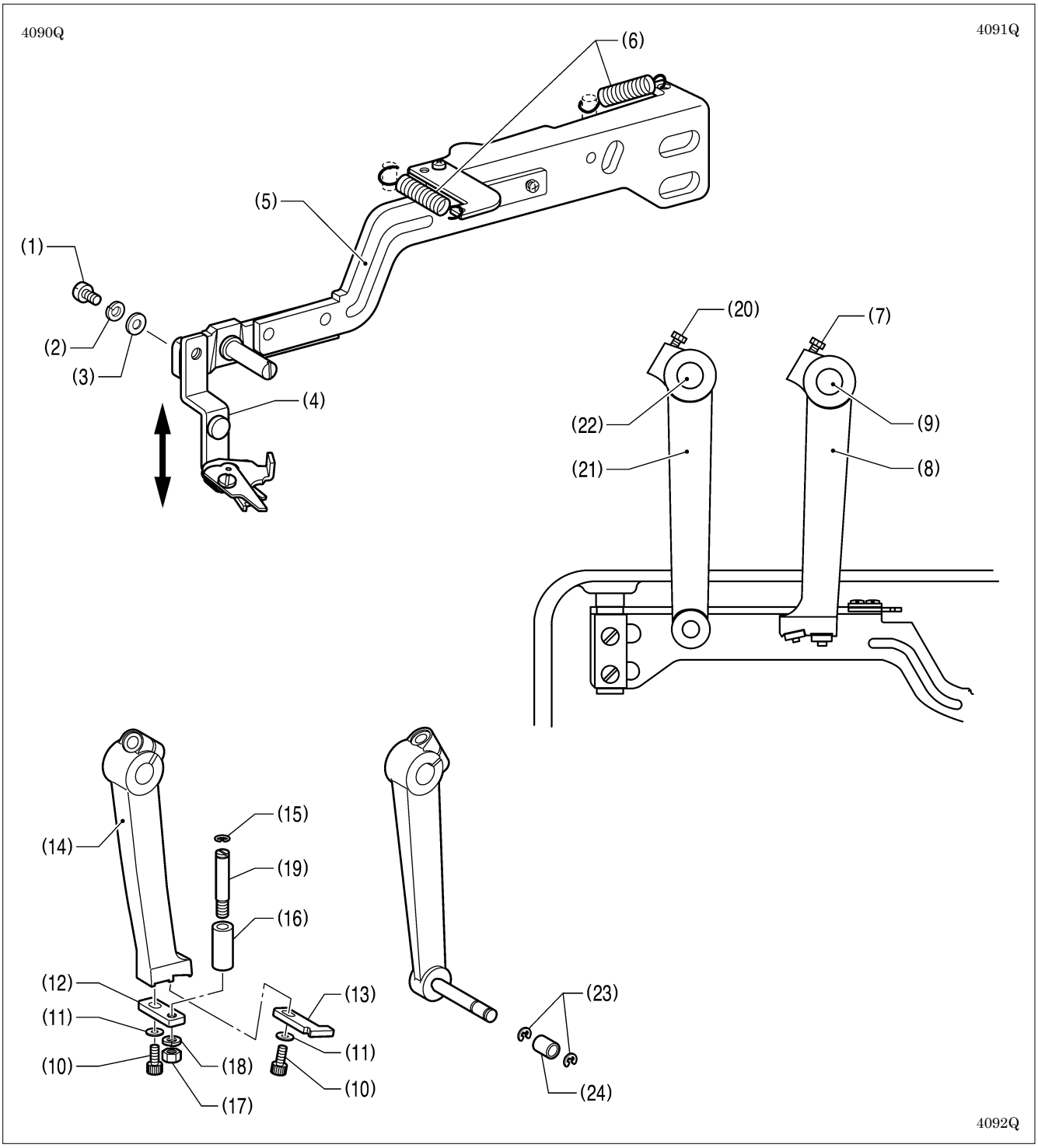




4089Q

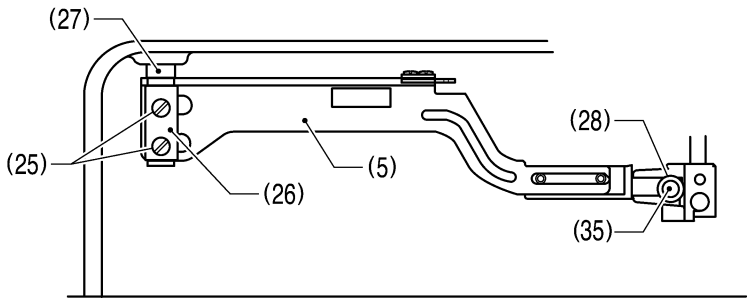
1. Remove the two screws (1), and then remove the two lever stoppers (2).
2. Remove the screw (3), and then remove the balancer (4) from the cutter bar fixing plate (5).
3. Loosen the set screw (6), and then remove the cutter bar fixing plate (5) from the thread breakage perceiving shaft (7).
4. Remove the two screws (8), and then remove the thread breakage sensor assembly (9).
5. Remove the thread breakage perceiving shaft (7) from the arm.
6. Remove the plain washers (10) and (11) and the screw (12), and then remove the thread guide (13) from the thread breakage perceiving shaft (7).

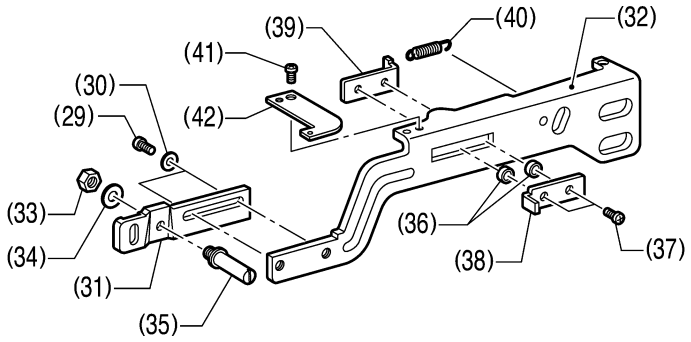
2-5. Upper thread trimmer mechanism

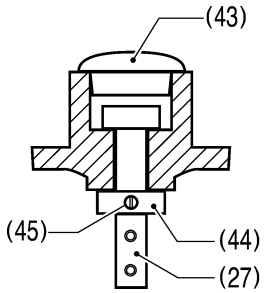


1. Remove the screw (1), spring washer (2) and plain washer (3), and then remove the upper thread trimmer assembly (4) from the thread trimmer lever set (5).
2. Remove the two springs (6) from the thread trimmer lever set (5).
3. Remove the bolt (7), and then remove the trimmer driving arm assembly (8) from the trimmer driving lever (9).
4. Remove the two bolts (10) and plain washers (11), and then remove the support plate (12) and the stopper (13) from the trimmer driving arm (14).
5. Remove the retaining ring (15), and then remove the driving arm roller (16).
6. Remove the nut (17) and the spring washer (18), and then remove the roller shaft (19) from the support plate (12).
7. Remove the bolt (20), and then remove the longitudinal feed arm assembly (21) from the trimmer driving lever (22).
8. Remove the two retaining rings (23), and then remove the longitudinal feed arm roller (24).

4093Q





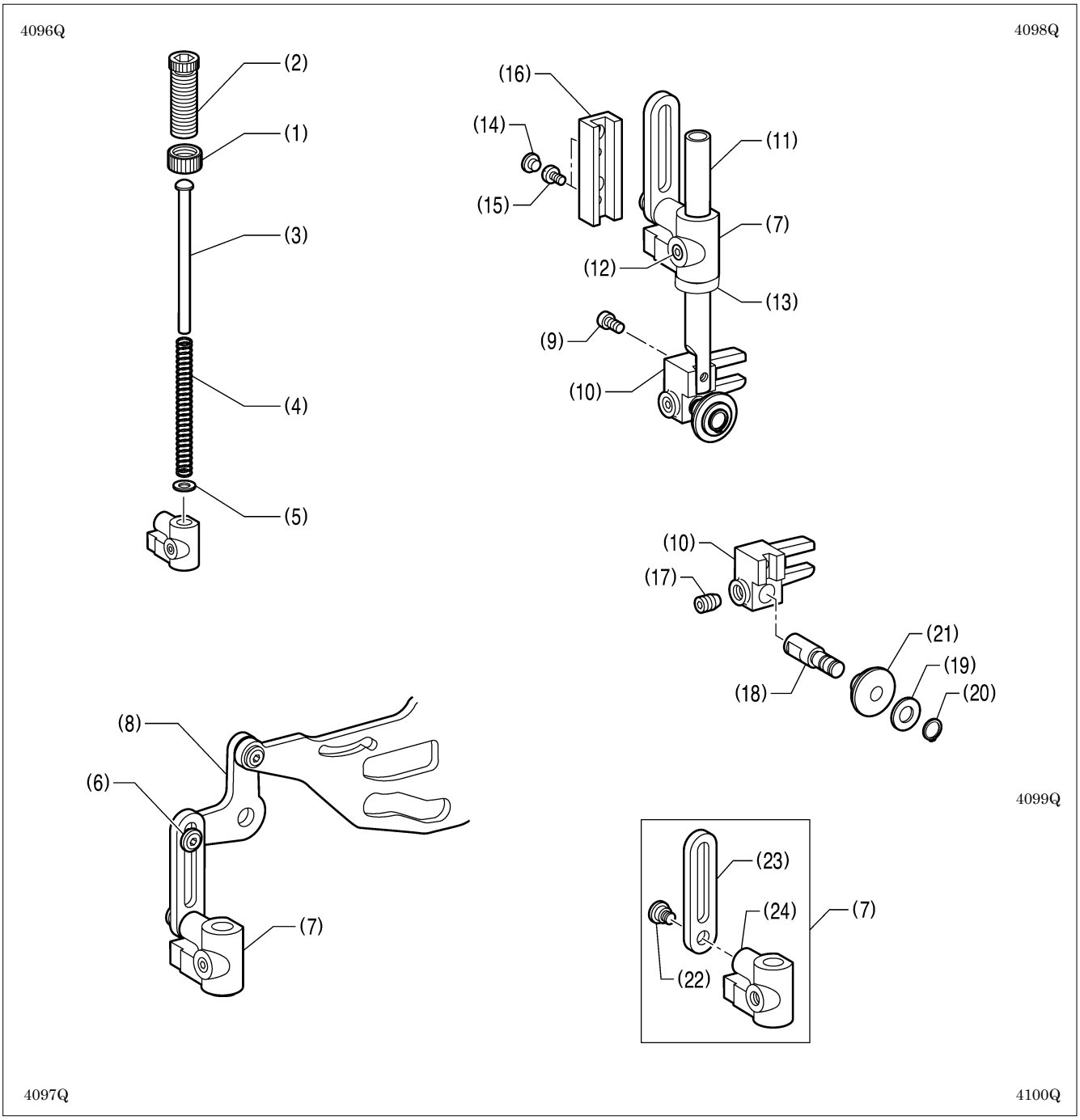


4094Q

4095Q

9. Remove the two shoulder screws (25) and the washer (26), and then remove the thread trimmer lever set (5) from the upper thread trimmer fulcrum shaft (27).
10. Remove the roller (28).
11. Remove the two screws (29) and plain washers (30), and then remove the setting plate (31) from the upper thread trimmer lever assembly (32)
12. Remove the nut (33) and the plain washer (34), and then remove the support shaft (35) from the setting plate (31).
13. Remove the two collars (36) and the screws (37), and then remove the back plate (38) and the stop plate (39) from the upper thread trimmer lever assembly (32).
14. Remove the spring (40).
15. Remove the screw (41), and then remove the spring hook plate (42) from the upper thread trimmer lever assembly (32).
16. Remove the rubber cap (43).
17. Loosen the two set screws (45) of the set screw collar assembly (44), and then remove the upper thread trimmer fulcrum shaft (27).

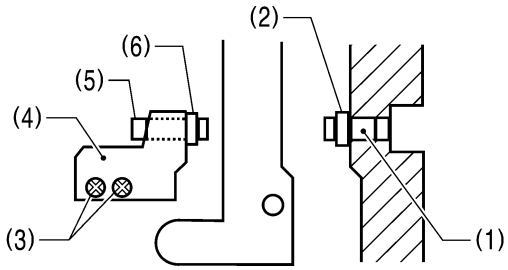
2-6. Presser bar mechanism

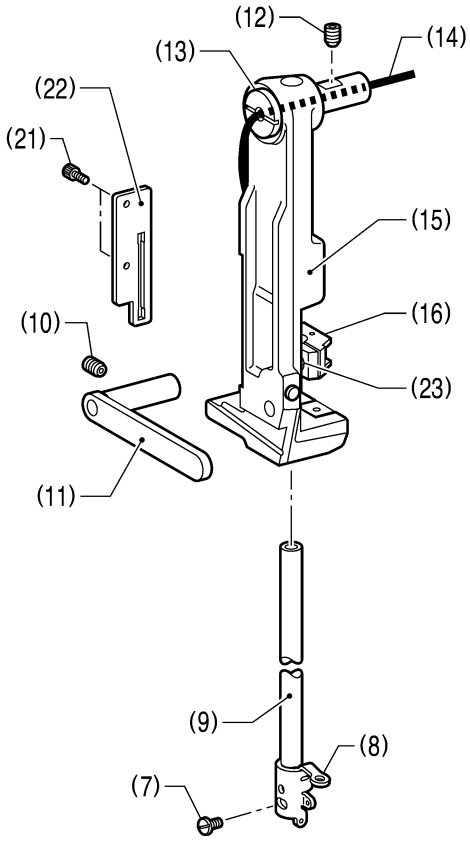


1. Loosen the presser adjusting nut (1).
2. Remove the presser adjusting screw (2), and then remove the spring (3), compression spring (4) and plain washer (5).
3. Remove the shoulder screw (6), and then remove the presser bar guide bracket assembly (7) from the knee lifter lever (8).
4. Remove the screw (9), and then remove the presser roller bracket (10) from the presser bar (11).
5. Loosen the set screw (12).
6. Remove the presser bar (11), and then remove the oil rejector (13) and the presser bar guide bracket assembly (7).
7. Remove the two rubber caps (14).
8. Remove the two screws (15), and then remove the needle bar guide (16).
9. Loosen the set screw (17), and then remove the roller shaft (18) from the presser roller bracket (10).
10. Remove the plain washer (19) and the retaining ring (20), and then remove the roller (21) from the roller shaft (18).
11. Remove the shoulder screw (22), and then remove the presser bar lifter link (23) from the presser bar guide bracket (24).

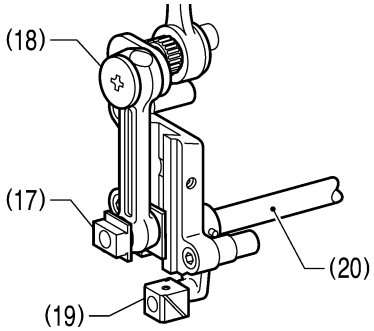
2-7. Needle bar and thread take-up mechanism (1)

4101Q





4102Q

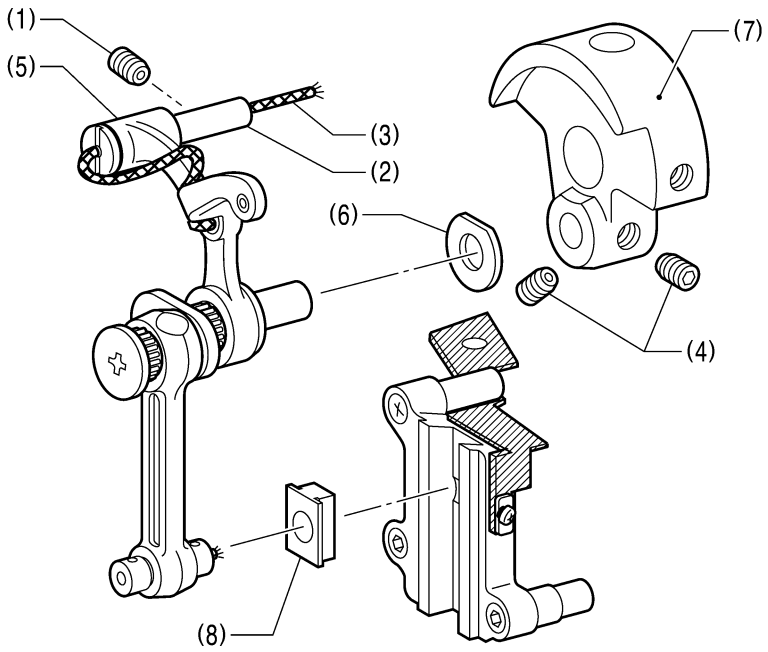


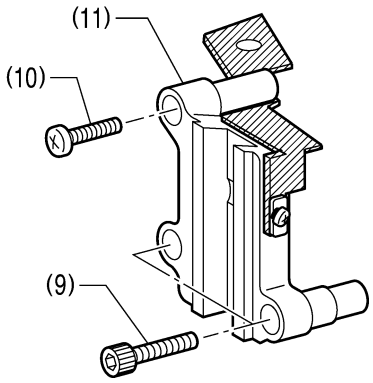
4103Q

1. Remove the set screw (1) and the nut (2) from the arm.
2. Remove the two screws (3), and then remove the stopper (4) from the arm.
3. Remove the set screw (5) and the nut (6) from the stopper (4).
4. Remove the set screw (7), and then remove the needle bar thread guide (8) from the needle bar (9).
5. Loosen the set screw (10), and then remove the needle bar thread guide (11).
6. Loosen the set screw (12), and then remove the needle bar bracket support shaft (13).
7. Remove the wick (14).
8. Remove the needle bar bracket assembly (15) from the arm.
9. Remove the slide block (17) of the needle bar clamp (16) from the thread take-up lever set (18).
10. Remove the slide block (19) of the needle bar bracket assembly (15) from the zigzag lever shaft (20).
11. Remove the bolt (21), and then remove the needle bar guide (22) from the needle bar bracket assembly (15).
12. Loosen the screw (23) of the needle bar clamp (16), and then remove the needle bar (9).

2-8. Needle bar and thread take-up mechanism (2)

4104Q



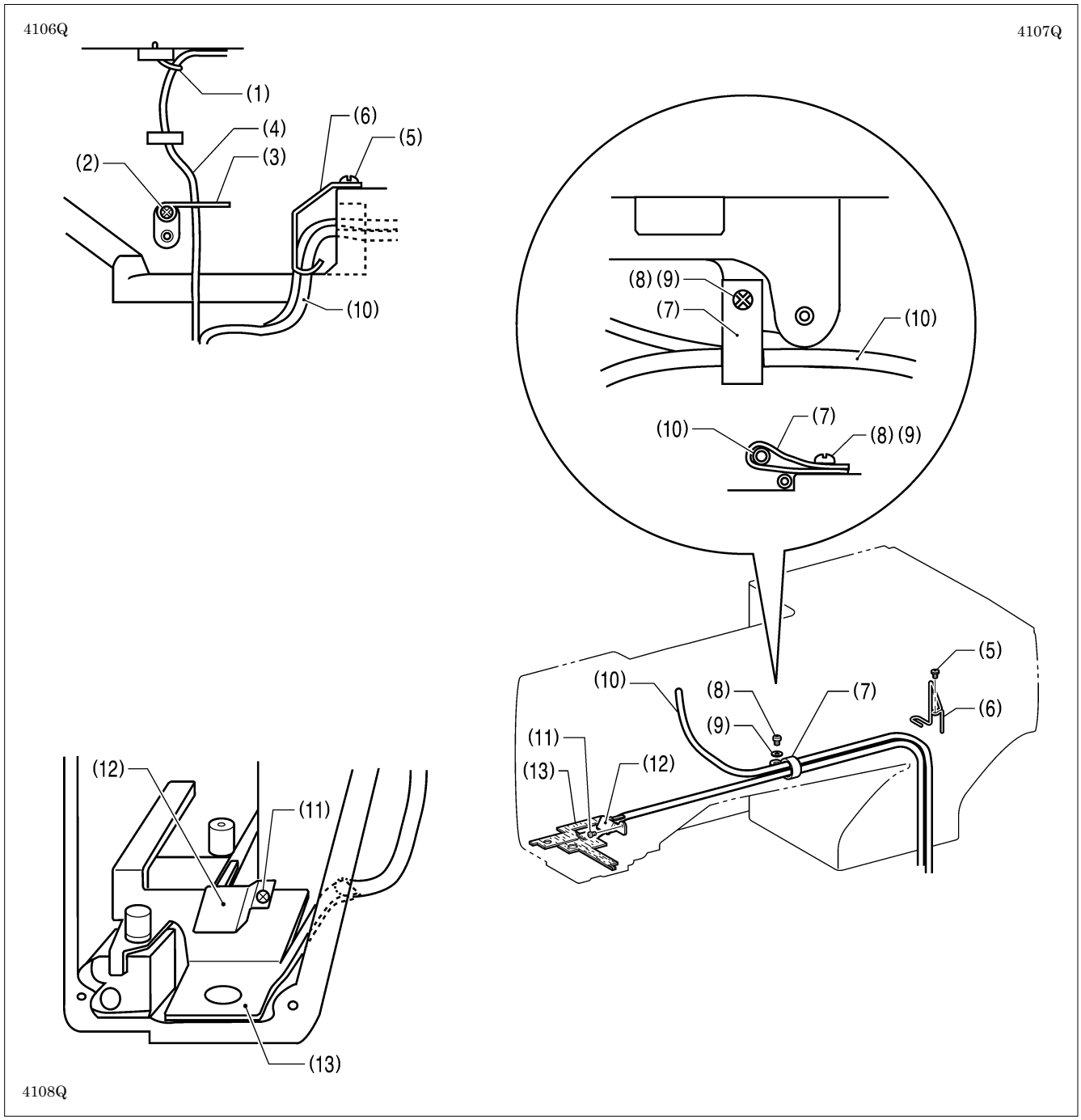


4105Q

1. Remove the set screw (1), and then remove the support shaft (2).
2. Remove the wick (3) and the felt (4).
3. Loosen the two set screws (5).
4. Remove the thread take-up lever set (6) and the washer (7) from the thread take-up crank (8).
5. Remove the needle bar bracket slide block (9).
6. Remove the two bolts (10) and the screw (11), and then remove the crank rod guide (12).

2-9. Lubrication mechanism (2)

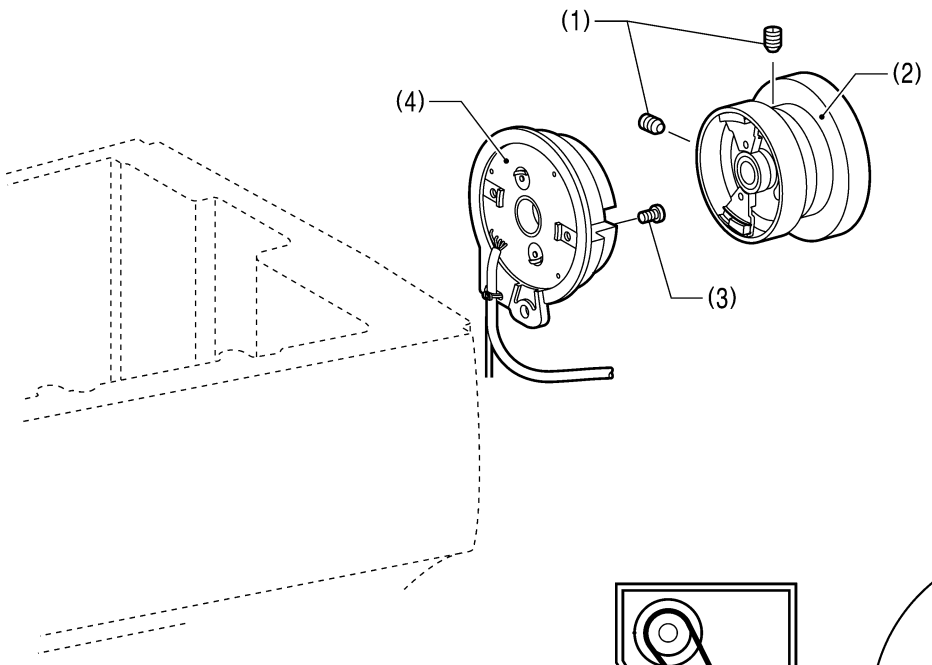
2-9-1. Oil tubes

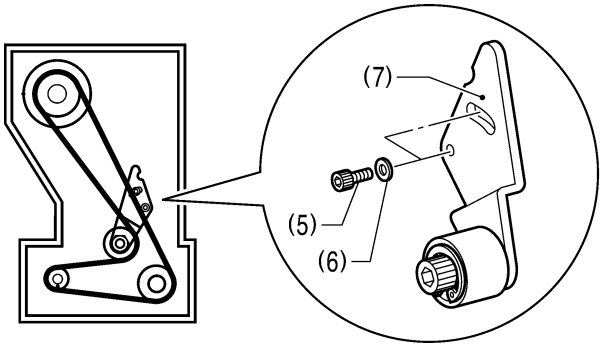


1. Remove the fastening band (1).
2. Remove the screw (2), and then remove the tube support M (3).
3. Disconnect the oil tube (4) that is connected to the oil terminal and the plunger pump.
4. Remove the screw (5), and then remove the tube support R (6).
5. Remove the cord holder (7), screw (8) and washer (9), and then disconnect the oil tube (10) that is connected between the oil terminal and the oil outlet.
6. Remove the screw (11), and then remove the felt holder (12).
7. Remove the oil tube assembly (13).

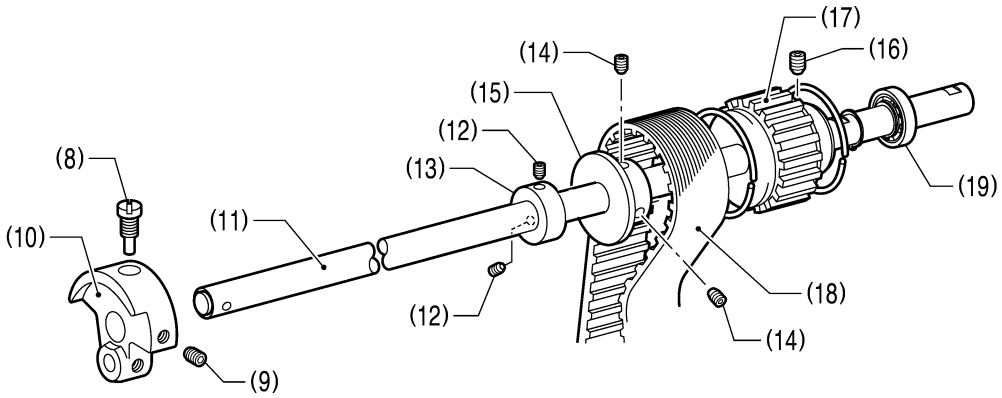
2-10. Upper shaft and tension pulley mechanisms

4109Q





4110Q

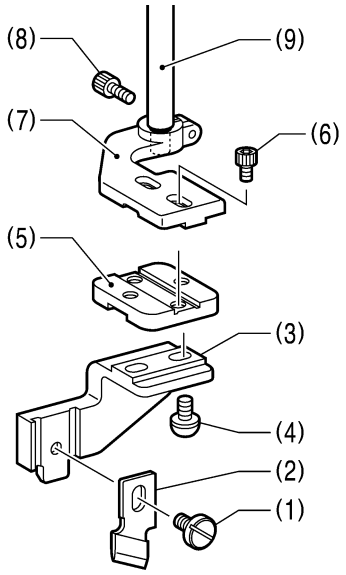


4111Q

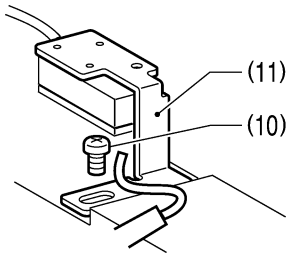
1. Loosen the two set screws (1), and then remove the pulley assembly (2).
2. Remove the two screws (3), and then remove the synchronizer assembly (4) from the arm.
3. Remove the two bolts (5) and plain washers (6), and then remove the tension pulley assembly (7).
4. Remove the screw (8) and set screw (9), and then remove the thread take-up crank (10) from the upper shaft assembly (11).
5. Loosen the two set screws (12), and then remove the set screw collar (13).
6. Loosen the two set screws (14), and then remove the bobbin winder pulley (15).
7. Loosen the two set screws (16), and then remove the timing pulley U assembly (17).
8. Remove the timing belt (18).
9. Remove the ball bearing (19).

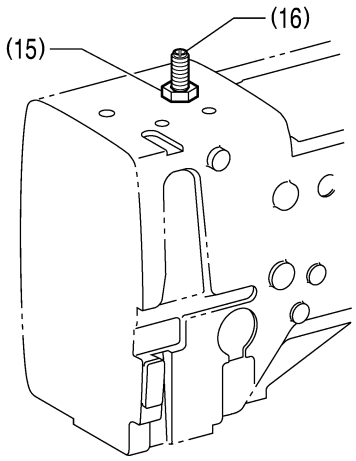
2-11. Cutter mechanism (1)

4112Q

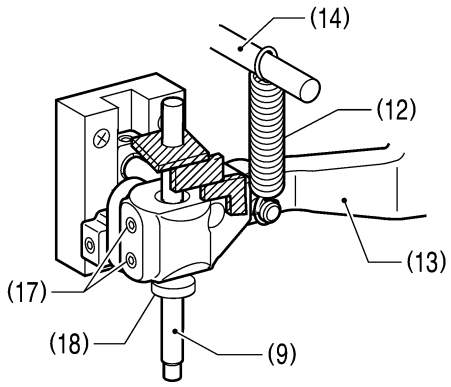


4113Q





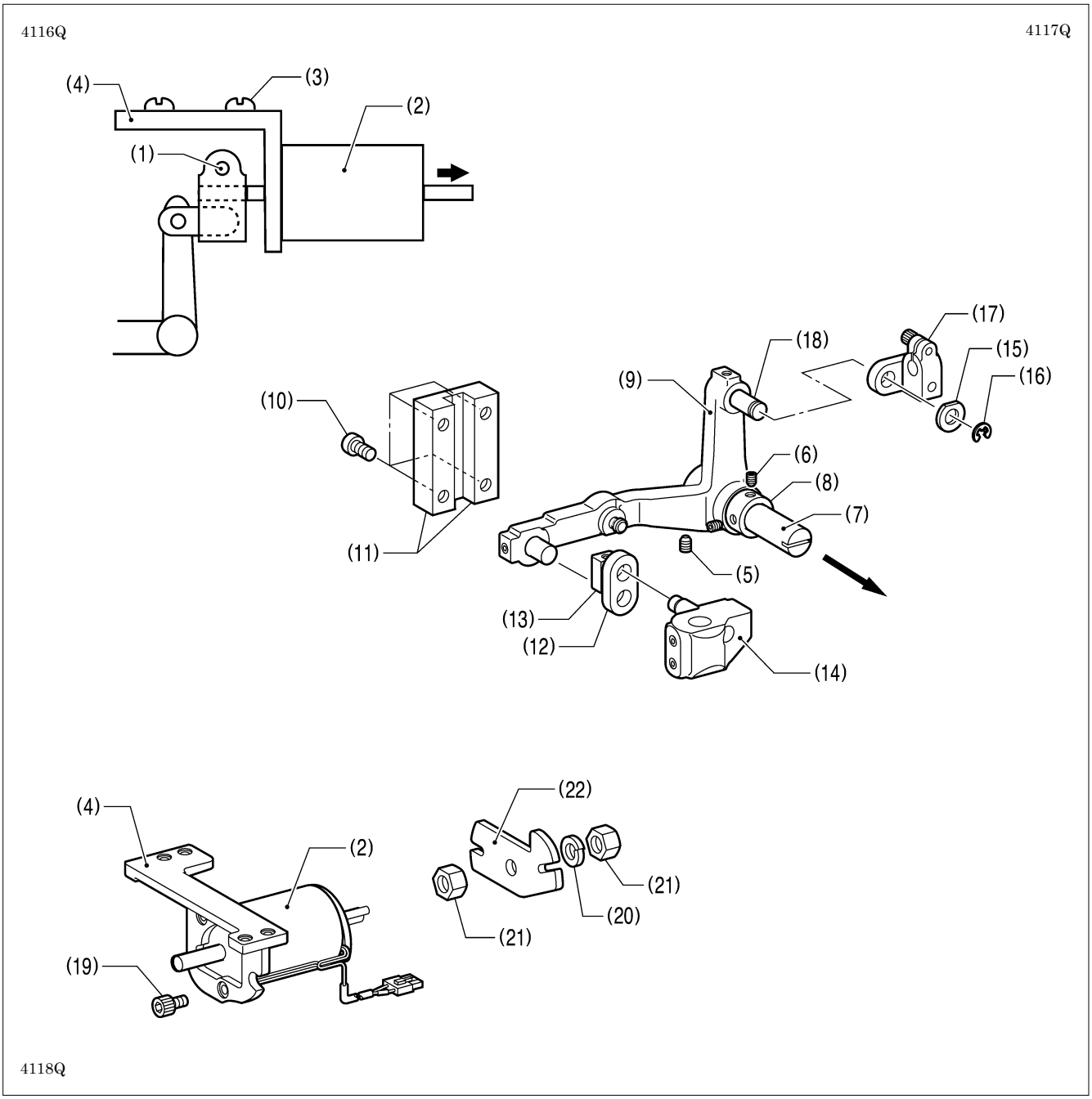
4114Q



4115Q

1. Remove the screw (1), and then remove the cutter (2) from the cutter holder DL (3).
2. Remove the two screws (4), and then remove the cutter holder DL (3) from the cutter holder M (5).
3. Remove the two bolts (6), and then remove the cutter holder M (5) from the cutter holder (7).
4. Remove the bolt (8), and then remove the cutter holder (7) from the cutter driving shaft (9).
5. Remove the screw (10), and then remove the cutter sensor setting plate (11).
6. Remove the spring (12) from the cutter driving arm assembly (13) and the tension release shaft (14).
7. Remove the nut (15), and then remove the adjusting screw assembly (16) from the arm.
8. Loosen the two set screws (17), and then remove the cutter driving shaft (9).
9. Remove the oil rejector (18).

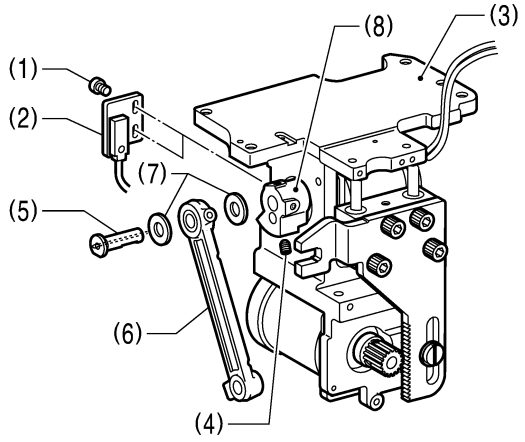
2-12. Cutter mechanism (2)



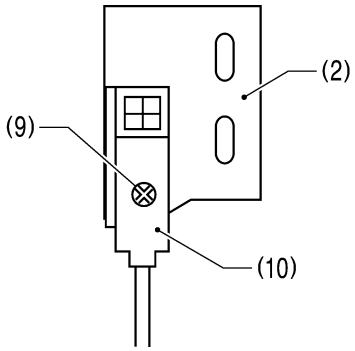
1. Loosen the bolt (1).
2. Take out the solenoid plunger from the cutter solenoid (2).
3. Remove the four screws (3), and then remove the cutter solenoid bracket (4).
4. Loosen the set screw (5).
5. Loosen the two set screws (6), and then remove the cutter driving arm shaft (7) from the set screw collar (8) and the cutter driving arm assembly (9).
6. Remove the four screws (10), and then remove the cutter bar guide (11).
7. Remove the cutter driving arm assembly (9) from the arm.
8. Remove the cutter driving link (12), the needle bar bracket slide block (13) and the driving shaft holder assembly (14) from the cutter driving arm assembly (9)
9. Remove the washer (15) and retaining ring (16), and then remove the cutter link bracket assembly (17) from the cutter link shaft (18).
10. Remove the three bolts (19), and then remove the cutter solenoid (2) from the cutter solenoid bracket (4).
11. Remove the spring washer (20) and the two nuts (21), and then remove the solenoid stopper (22) from the solenoid plunger.

2-13. Needle zigzag mechanism

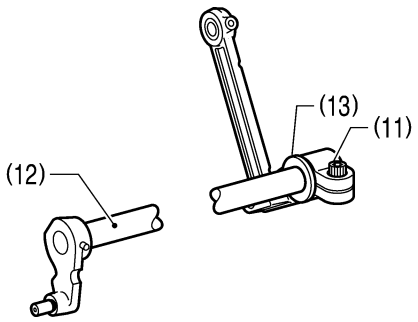
4119Q



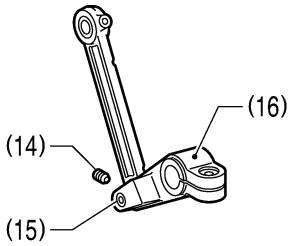
4120Q



4121Q

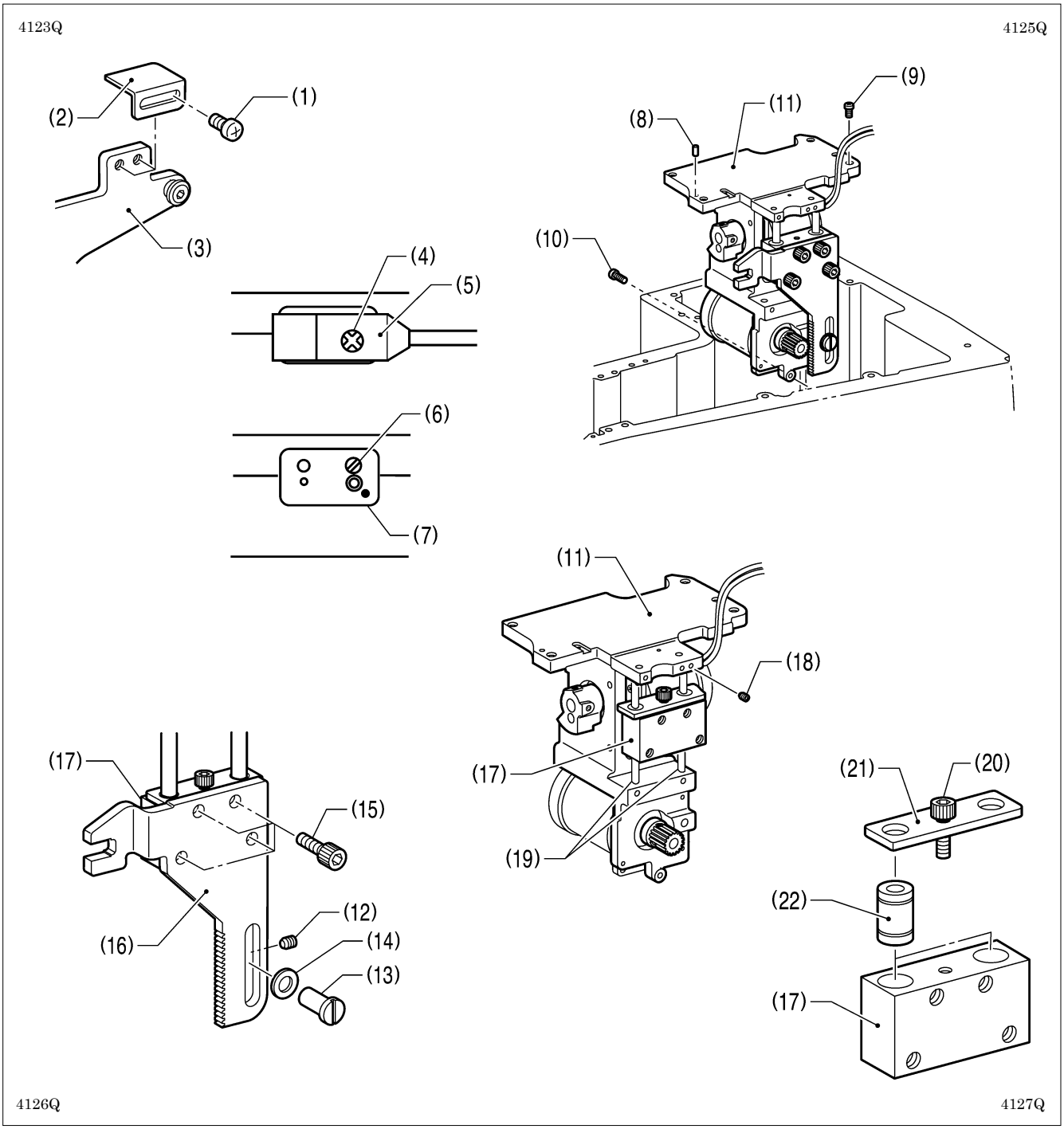


4122Q



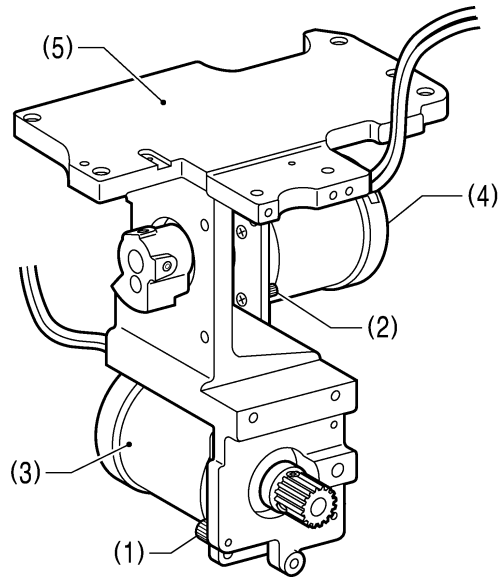
1. Remove the two screws (1), and then remove the zigzag sensor plate (2) from the motor bracket (3).
2. Loosen the set screw (4), and then remove the motor lever shaft (5), the zigzag connecting rod (6) and the two washers (7) from the motor lever (8).
3. Remove the screw (9), and then remover the sensor (10) from the zigzag sensor plate (2).
4. Remove the bolt (11), and then remove the zigzag lever F assembly (12) and the thrust washer (13).
5. Loosen the set screw (14), and then remove the zigzag connecting rod shaft (15) and the zigzag lever (16).

2-14. Presser lifter mechanism (1)

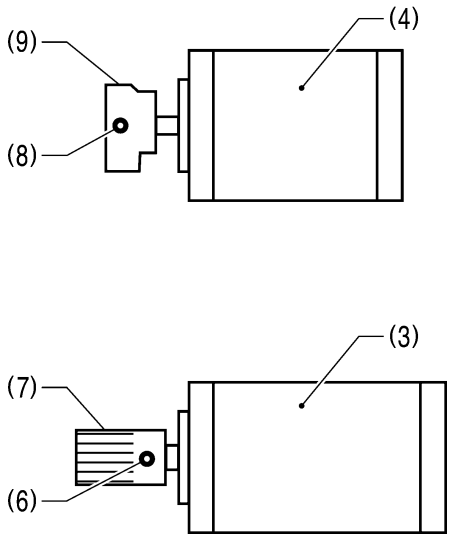


1. Remove the two screws (1), and then remove the clamp sensor dog (2) from the upper thread trimmer driving link (3).
2. Remove the screw (4), and then remove the clamp sensor (5).
3. Remove the flat screw (6), and then remove the clamp sensor plate (7).
4. Remove the two positioning pins (8).
5. Remove the four screws (9) and the screw (10), and then remove the motor bracket assembly (11) from the top of the arm.
6. Loosen the set screw (12), and then remove the driving arm presser (13) and the washer (14).
7. Remove the four bolts (15), and then remove the presser driving arm (16) from the guide bracket (17).
8. Loosen the four set screws (18), and then remove the two guide shafts (19) and the guide bracket (17).
9. Remove the bolt (20), and then remove the bearing holder (21).
10. Remove the two linear ball bearings (22) from the guide bracket (17).

2-15. Presser lifter mechanism (2)



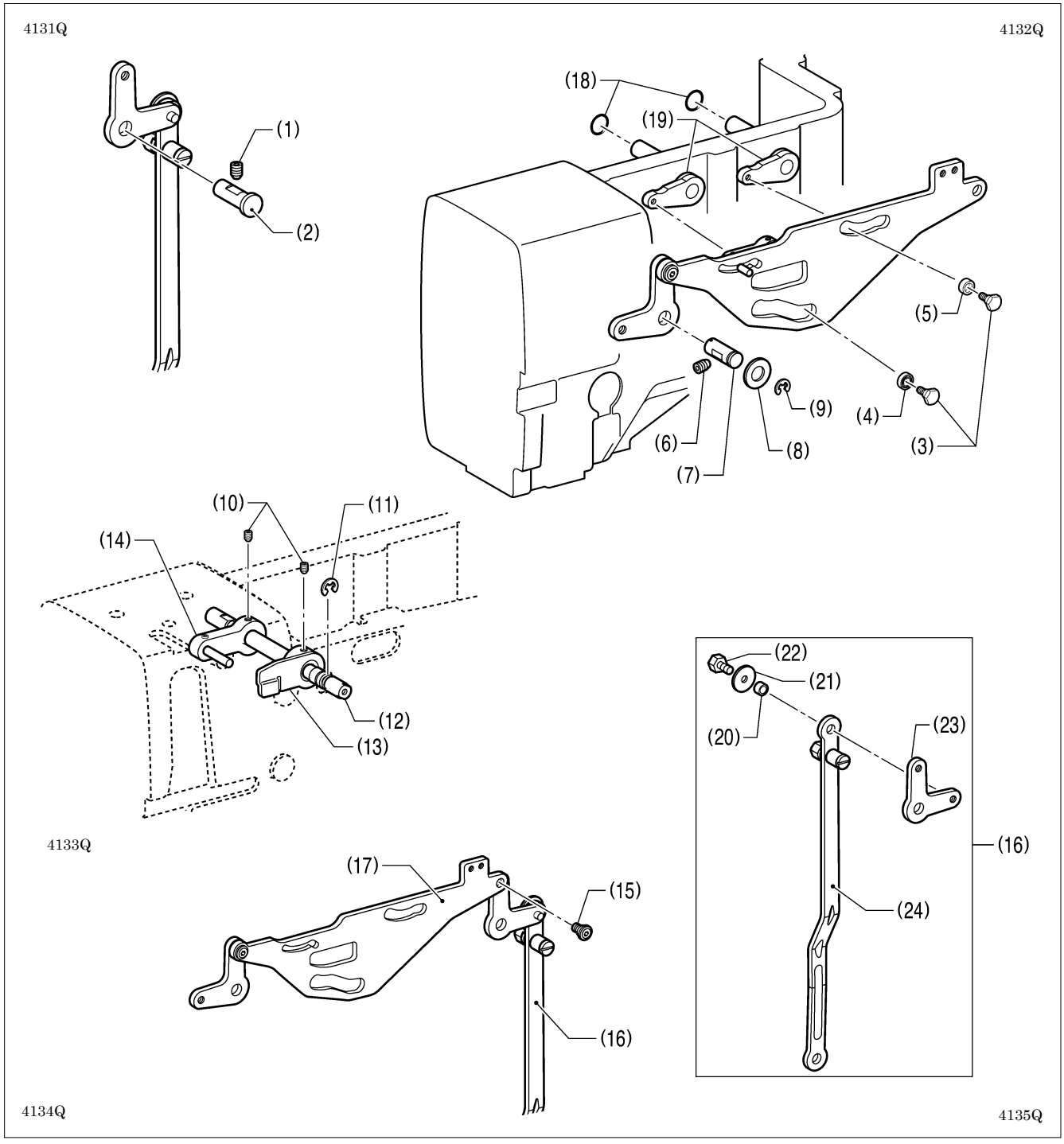
4129Q



4130Q

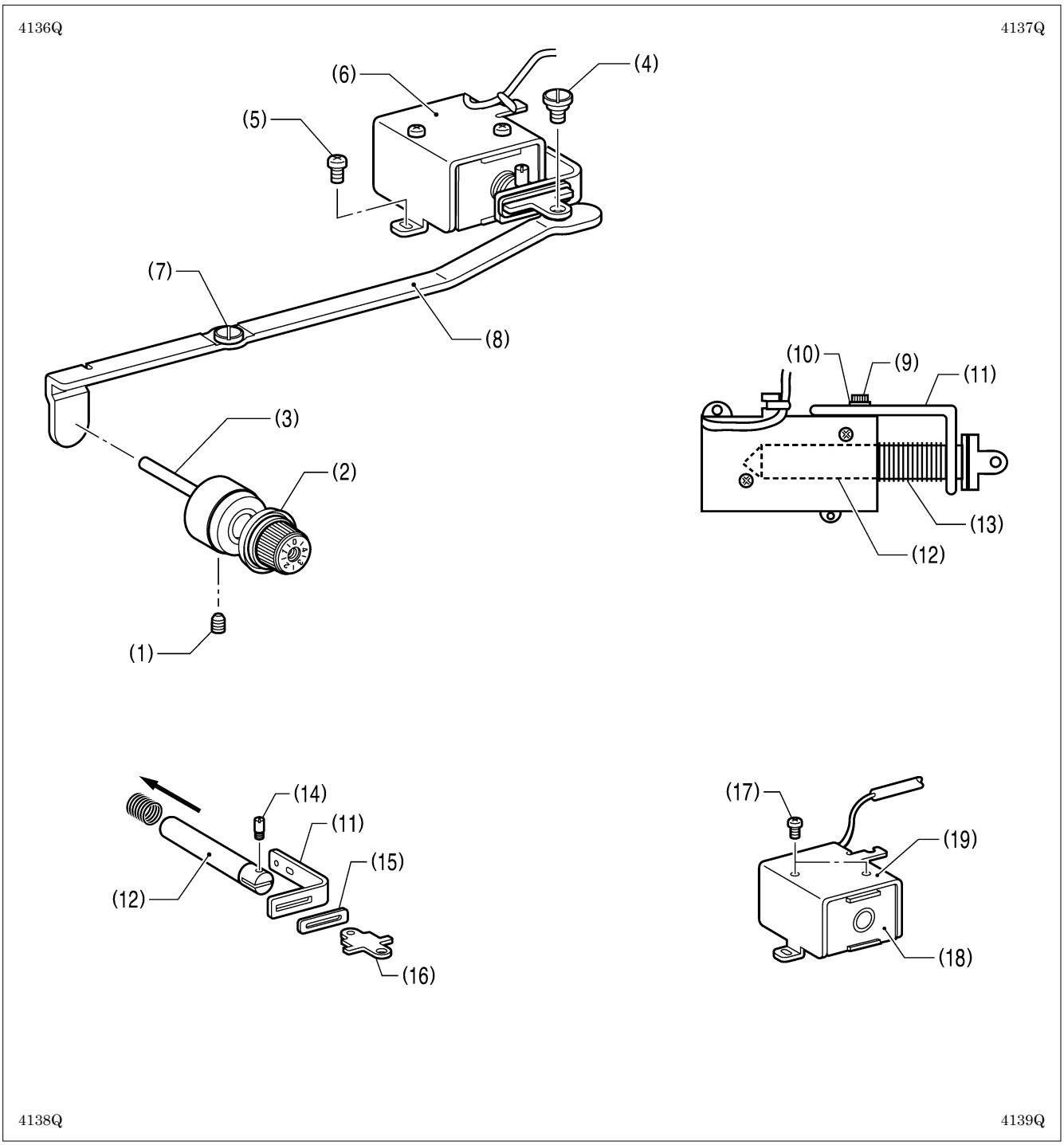
1. Remove the three bolts (1) and the four bolts (2), and then remove the pulse motor FT (for presser lifter) (3) and the pulse motor N assembly (for needle zigzag) (4) from the motor bracket (5).
2. Remove the two set screws (6), and then remove the gear (7) from the pulse motor FT (for presser lifter) (3).
3. Remove the two set screws (8), and then remove the motor lever (9) from the pulse motor N assembly (for needle zigzag) (4).

2-16. Presser lifter mechanism (3)



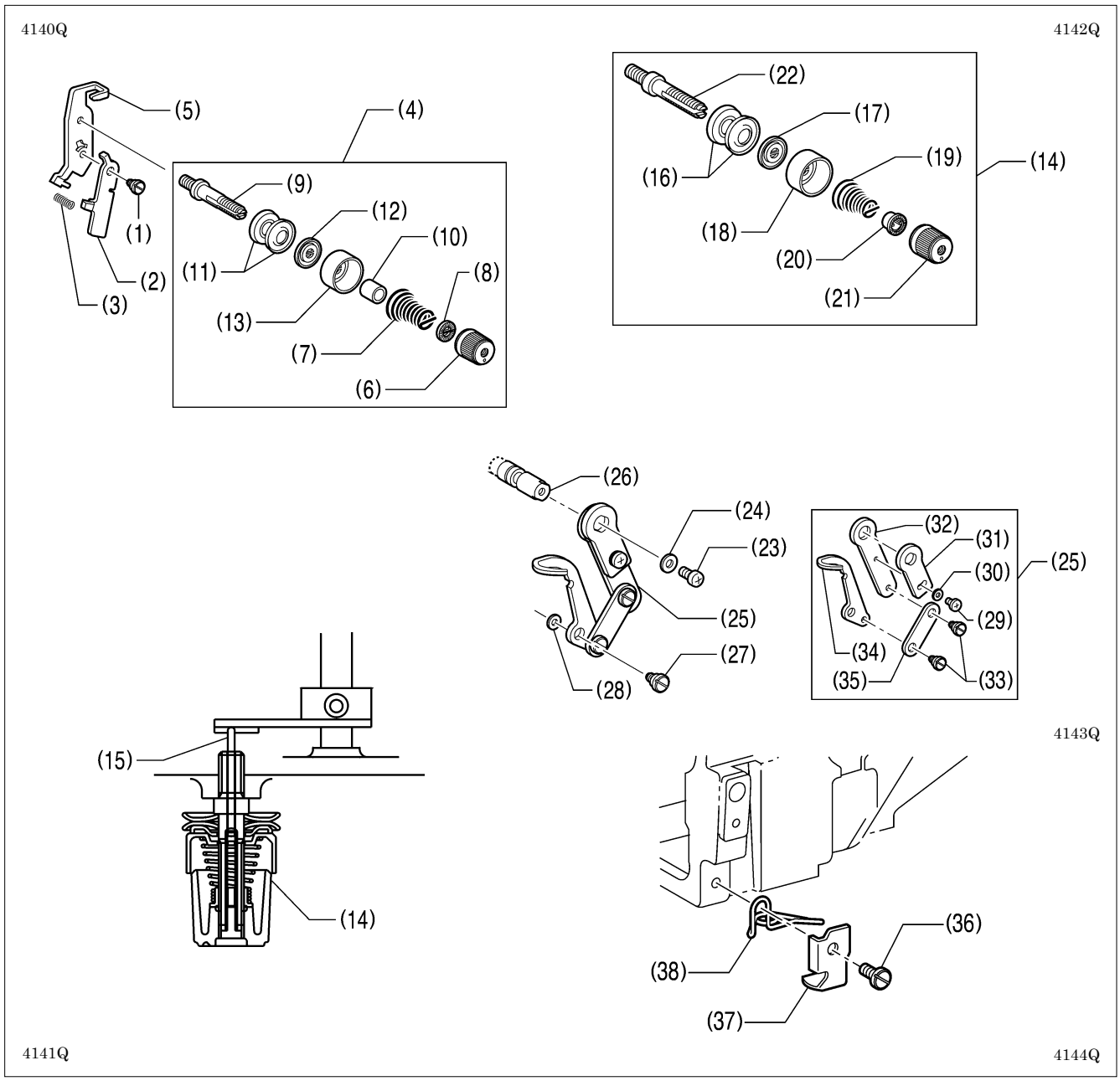
1. Loosen the set screw (1), and then remove the lifter shaft A (2).
2. Remove the two shoulder screws (3), and then remove the ball bearing (4) and the driving lever roller (5).
3. Remove the set screw (6).
4. Remove the lifter shaft (7), plain washer (8) and retaining ring (9).
5. Loosen the two set screws (10).
6. Remove the retaining ring (11), and then remove the tension release shaft (12), tension release cam (13) and tension release driving lever (14).
7. Remove the shoulder screw (15), and then remove the presser lifter connecting rod set (16) and the lifter lever assembly (17).
8. Remove the two O-ring (18) and the two trimmer driving levers (19).
9. Remove the spacer (20), washer D (21) and bolt (22), and then remove the knee lifter lever (23) from the presser lifter connecting rod assembly (24).

2-17. Tension release mechanism (1)



1. Loosen the set screw (1).
2. Remove the tension stud bracket assembly (2) and the tension release pin (3).
3. Remove the shoulder screw (4).
4. Remove the two screws (5), and then remove the tension release solenoid assembly (6).
5. Remove the shoulder screw (7), and then remove the tension release link (8).
6. Remove the bolt (9) and plain washer (10), and then remove the plate (11), plunger (12) and spring (13).
7. Remove the plunger pin (14), and then remove the plunger (12), tension release rubber assembly (15) and the tension release solenoid link (16).
8. Remove the two screws (17), and then remove the tension release solenoid (18) from the solenoid holder (19).

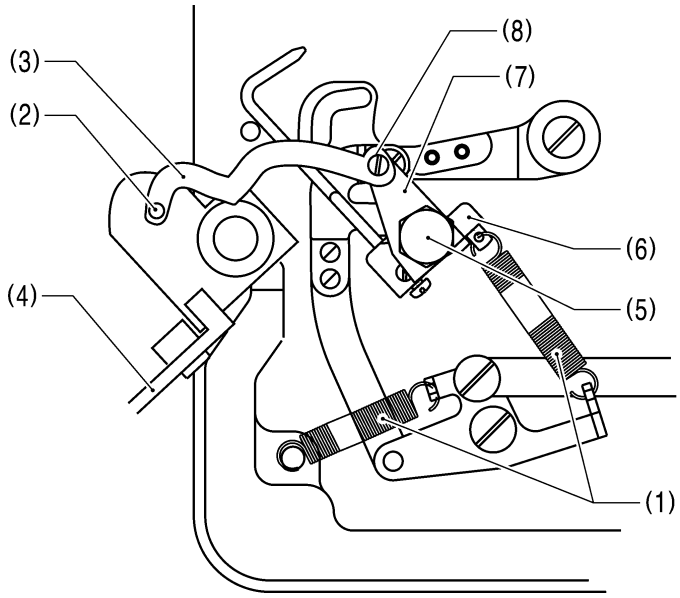
2-18. Tension release mechanism (2)



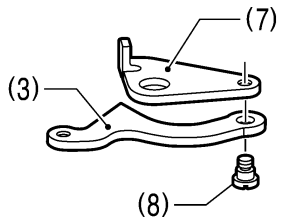
1. Remove the shoulder screw (1), and then remove the tension release lever (2) and the spring (3).
2. Remove the tension stud assembly (4) from the tension release lever bracket (5).
3. Remove the tension nut (6), and then remove the spring (7) and washer (8) from the tension stud (9).
4. Remove the collar (10), and then remove the two tension discs (11), tension disc pressers (12) and (13) from the tension stud (9).
5. Remove the sub thread tension assembly (14) and the tension release pin (15) from the arm.
6. Remove the two tension discs (16), tension disc pressers (17) and (18), tension adjusting spring (19), washer (20) and tension nut (21) from the sub tension stud (22).
7. Remove the screw (23) and the washer (24), and then remove the thread take-up lever assembly (25) from the tension release shaft (26).
8. Remove the shoulder screw (27), and then remove the washer (28) from the arm.
9. Remove the screw (29) and the washer (30), and then remove the lever (31) from the adjusting lever (32).
10. Remove the two shoulder screws (33), and then remove the adjusting lever (32) and the tension take-up lever (34) from the lever link (35).
11. Remove the screw (36), and then remove the thread guide cover (37) and the arm thread guide L (38).

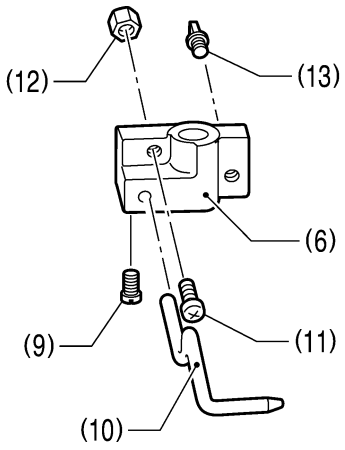
2-19. Bobbin presser mechanism

4145Q



4146Q



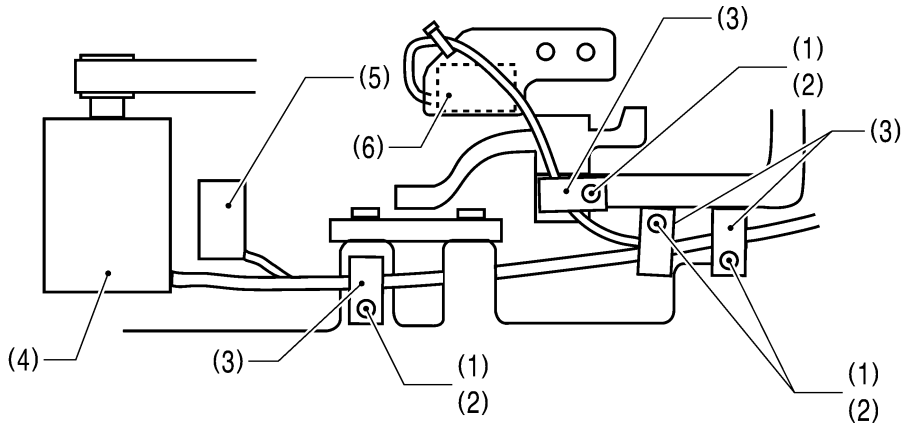


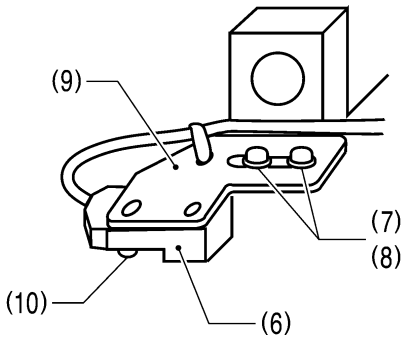
4147Q

1. Remove the two extension springs (1).
2. Remove the shoulder screw (2), and then remove the opening plate (3) from the rotary hook cover (4).
3. Remove the shoulder screw (5), and then remove the bobbin presser bracket assembly (6) and the auxiliary plate (7).
4. Remove the shoulder screw (8), and then remove the auxiliary plate (7) and the opening plate (3).
5. Loosen the set screw (9), and then remove the bobbin presser (10) from the bobbin presser bracket assembly (6).
6. Remove the screw (11) and the nut (12).
7. Remove the spring hook U (13).

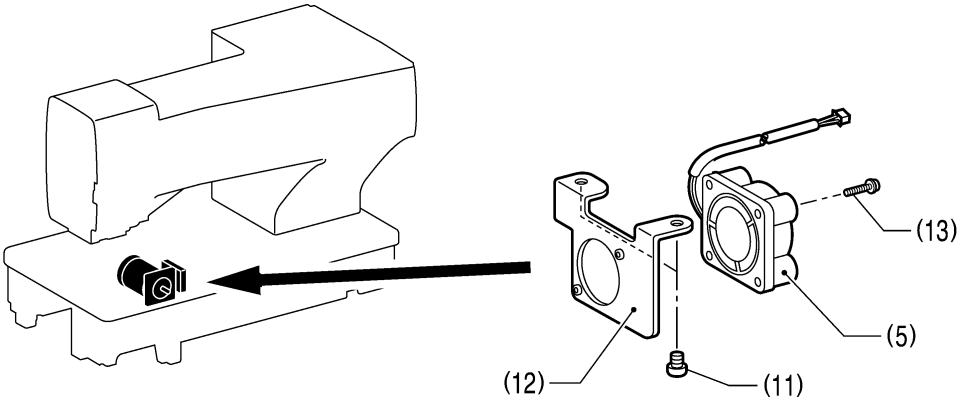
2-20. Feed mechanism (1)

4148Q





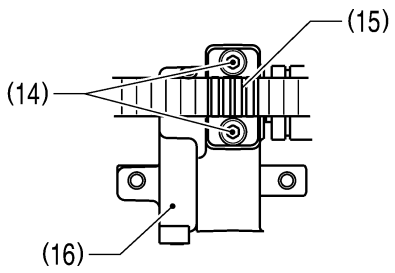
4149Q



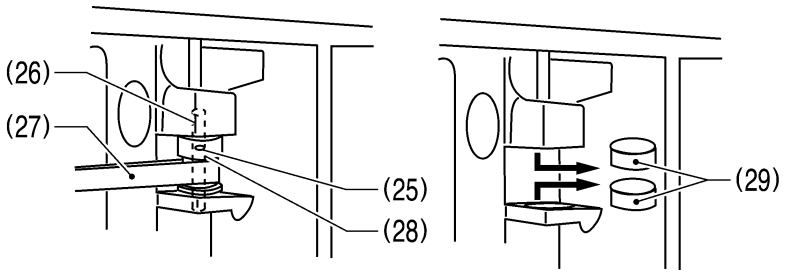
4150Q

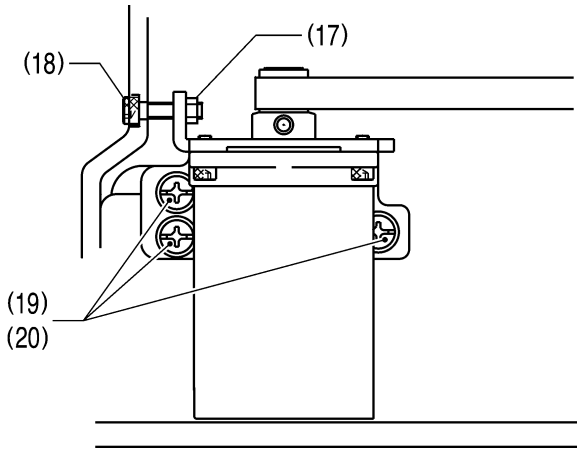
1. Remove the four screws (1) and washers (2), and then remove the four cord holders (3).
2. Disconnect the cords for the feed pulse motor (4), DC fan motor 40 assembly (5) and feed home position sensor (6).
3. Remove the two screws (7) and plain washers (8), and then remove the feed sensor support plate (9).
4. Remove the screw (10), and then remove the feed home position sensor (6) from the feed sensor support plate (9).
5. Remove the two screws (11), and then remove the feed motor cover (12).
6. Remove the two screws (13), and then remove the DC fan motor 40 assembly (5) from the feed motor cover (12).

4151Q

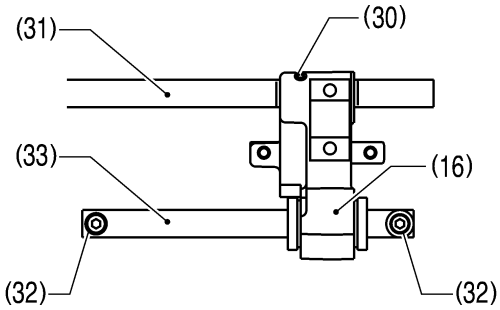


4154Q

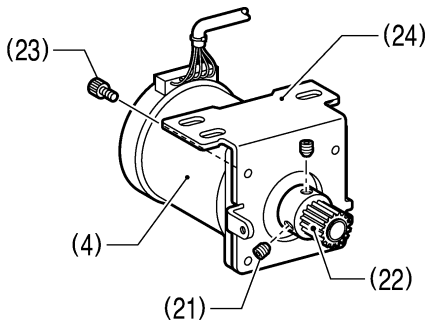




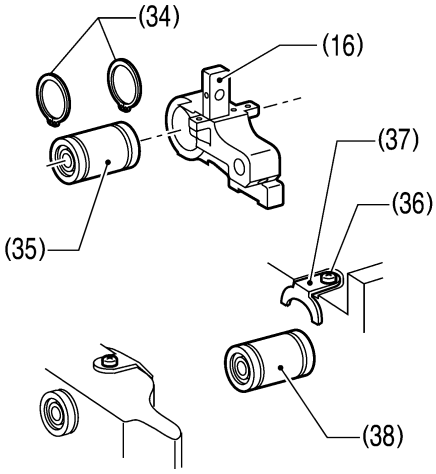
4152Q



4155Q



4153Q

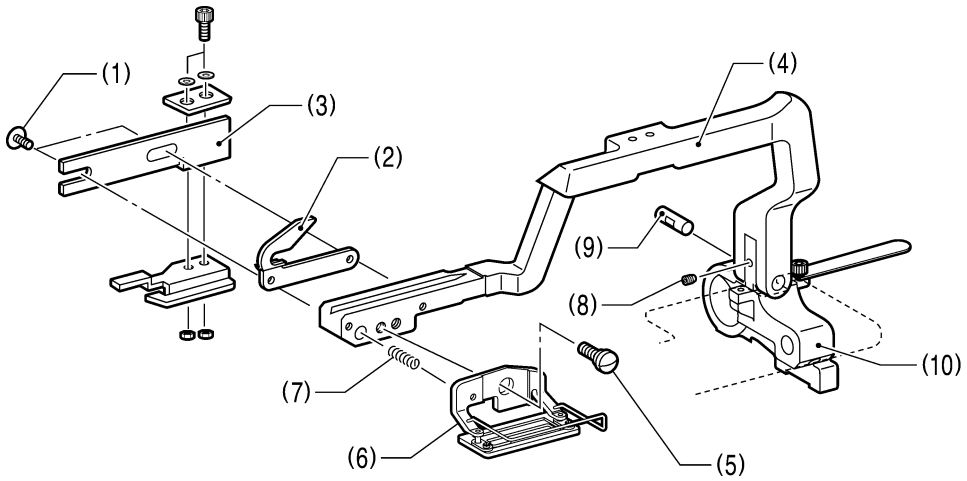


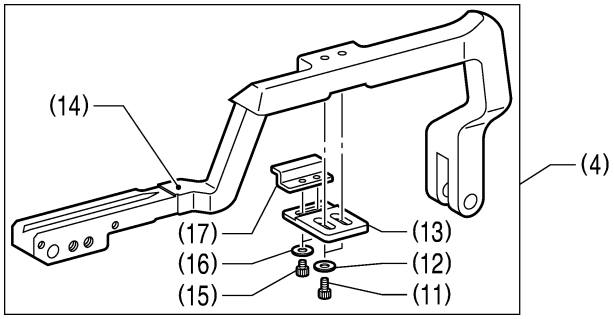
4156Q

7. Remove the two bolts (14), and then remove the belt holder (15) from the feed arm support (16).
8. Remove the nut (17), and then remove the bolt (18).
9. Remove the three screws (19) and plain washers (20).
10. Loosen the two set screws (21), and then remove the pulley A assembly (22).
11. Remove the four bolts (23), and then remove the motor mounting bracket (24) from the feed pulse motor (4).
12. Loosen the two set screws (25), and then remove the support shaft (26).
13. Remove the timing belt (27) and the pulley B assembly (28).
14. Remove the two ball bearings (29).
15. Loosen the set screw (30), and then remove the feed guide shaft B (31) from the feed arm support (16).
16. Remove the two bolts (32).
17. Remove the feed arm support (16) and the feed guide shaft A (33).
18. Remove the two retaining rings (34), and then remove the linear bush (35) from the feed arm support (16).
19. Remove the two screws (36), and then remove the two ball bearing stoppers (37).
20. Remove the two linear bushes (38) for the feed guide shaft B (31).

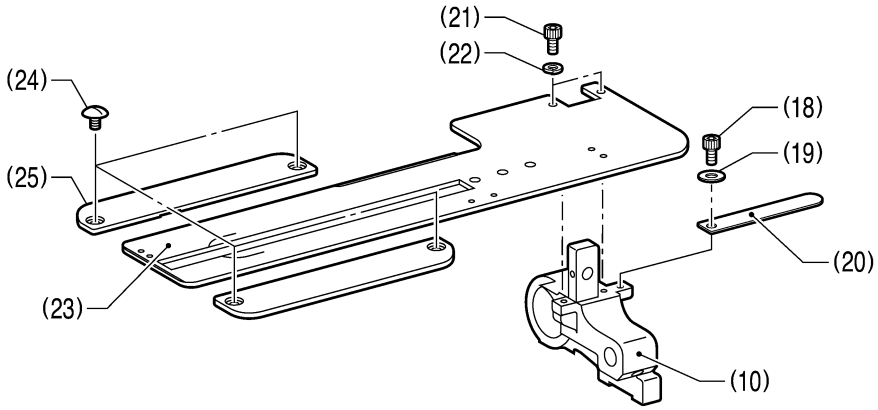
2-21. Feed mechanism (2)

4157Q





4158Q

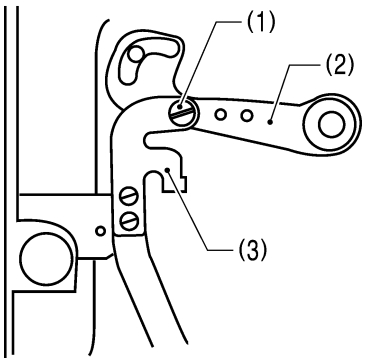


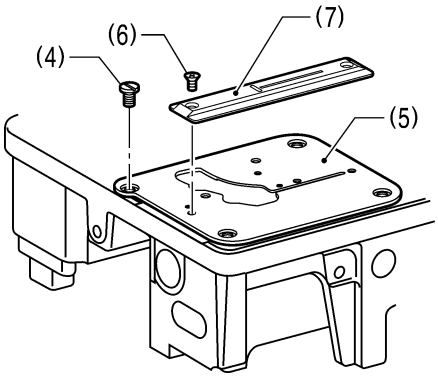
4159Q

1. Remove the two screws (1), and then remove the feed arm support (2) and the opening cam assembly (3) from the feed arm assembly (4).
2. Remove the shoulder screw (5), and then remove the work clamp assembly (6) and the spring (7) from the feed arm assembly (4).
3. Loosen the set screw (8), and then remove the feed arm assembly (4) and the feed arm support shaft (9) from the feed arm support (10).
4. Remove the two bolts (11) and washers (12), and then remove the support plate (13) from the feed arm (14).
5. Remove the two bolts (15) and washers (16), and then remove the cam (17) from the support plate (13).
6. Remove the bolt (18) and plain washer (19), and then remove the feed cover (20) from the feed arm support (10).
7. Remove the two bolts (21) and spring washers (22), and then remove the length feed plate (23) from the feed arm support (10).
8. Remove the four screws (24), and then remove the two feed presser plates (25).

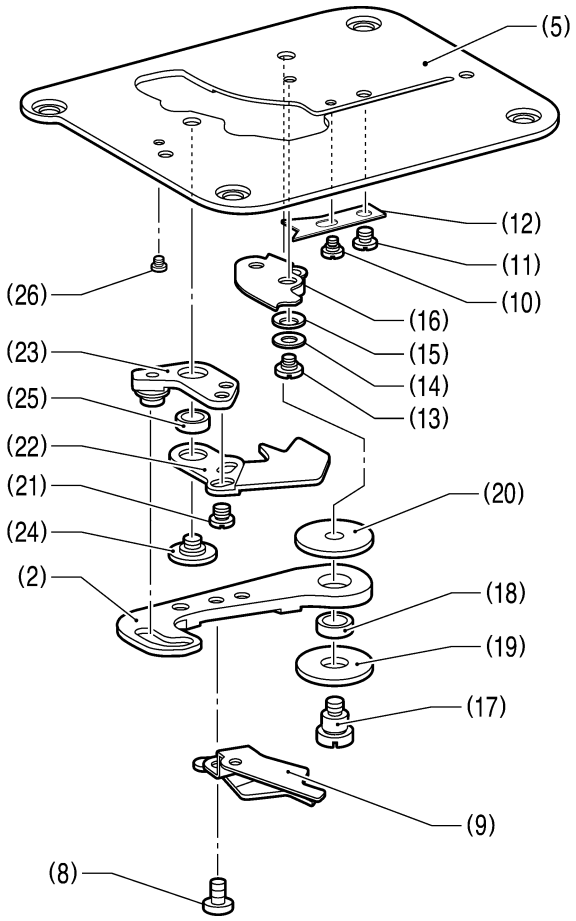
2-22. Lower thread trimmer mechanism (1)

4160Q





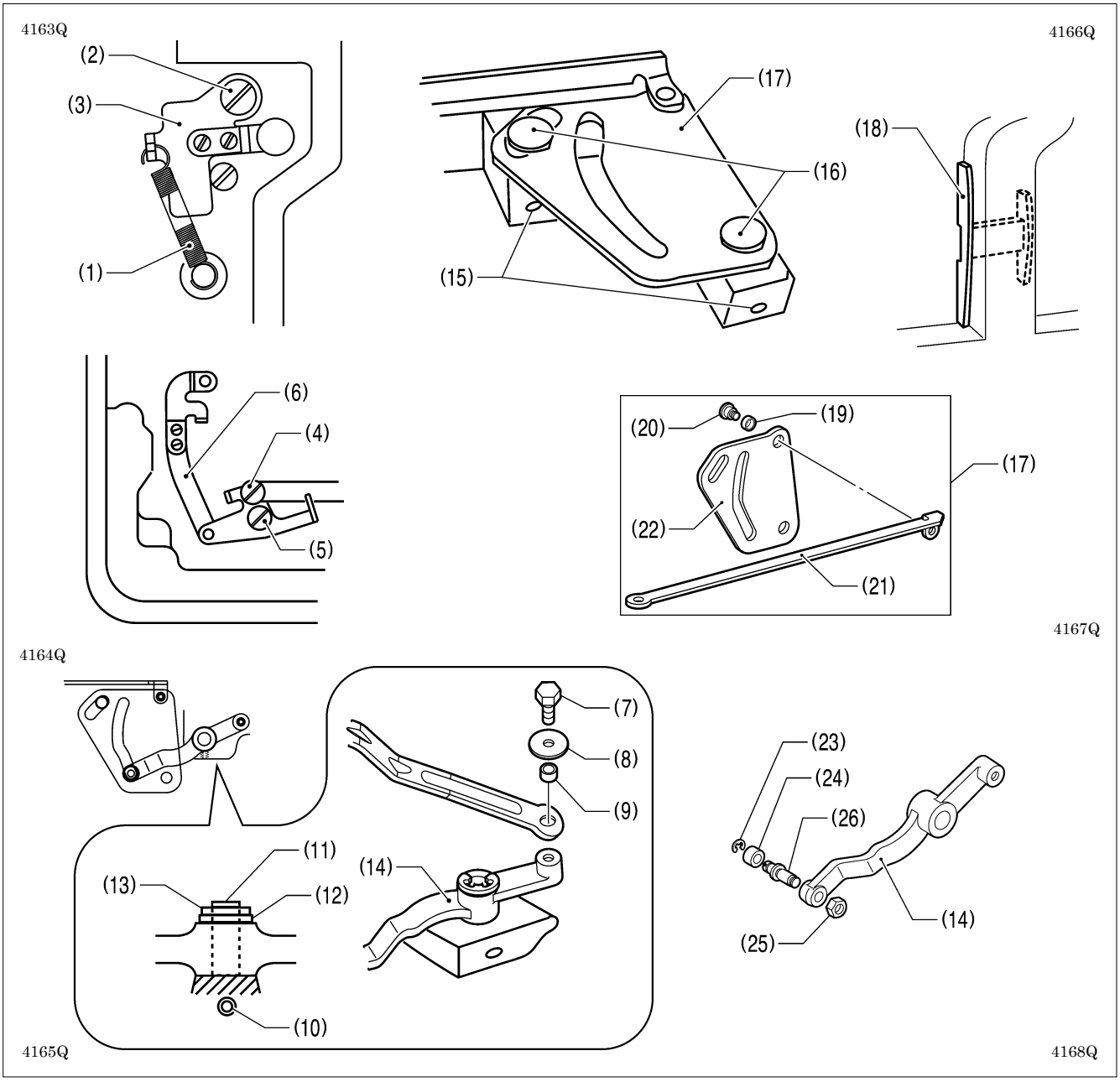
4161Q



4162Q

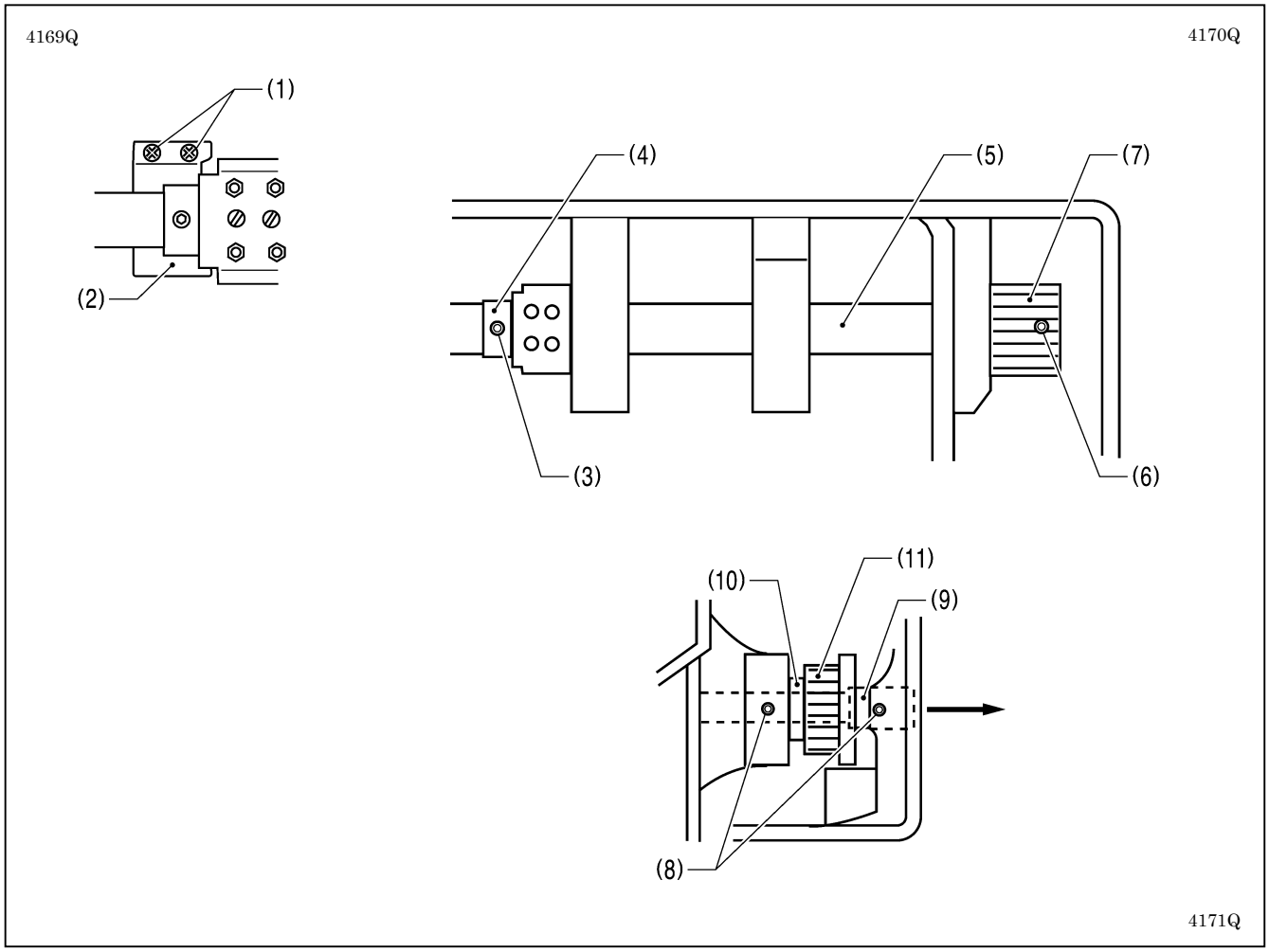
1. Remove the shoulder screw 4.37 (1), and then remove the knife driving lever (2) from the lower thread link assembly (3).
2. Remove the four screws (4), and then remove the base plate (5).
3. Remove the two flat screws (6), and then remove the needle plate (7).
4. Remove the two screws (8), and then remove the fixed knife set (9) from the knife driving lever (2).
5. Remove the shoulder screw (10) and the screw (11), and then remove the lower thread presser (12) from the base plate (5).
6. Remove the shoulder screw (13), plain washer (14), washer (15), and then remove lower thread clamp plate assembly (16) from the base plate (5).
7. Remove the shoulder screw (17), collar (18), washer U (19) and washer D (20), and then remove the knife driving lever (2) from the base plate (5).
8. Remove the two screws (21), and then remove the lower thread retainer (22) from the lever assembly (23).
9. Remove the screw (24) and collar (25), and then remove the lever assembly (23) from the base plate (5).
10. Remove the screw (26).

2-23. Lower thread trimmer mechanism (2)



1. Remove the plate spring (1).
2. Remove the shoulder screw (2), and then remove the opening plate assembly (3).
3. Remove the shoulder screw (4).
4. Remove the shoulder screw (5), and then remove the lower thread trimmer link assembly (6).
5. Remove the bolt (7), plain washer D (8) and spacer (9).
6. Loosen the set screw (10).
7. Remove the lower thread trimmer cam shaft (11), washer (12) and retaining ring (13).
8. Remove the lower thread trimmer cam lever (14).
9. Loosen the two set screws (15).
10. Remove the two lever shafts (16).
11. Remove the lower thread trimmer cam assembly (17) from the cover (18).
12. Remove the cover (18).
13. Remove the driving lever roller (19) and shoulder screw (20), and then remove the lower thread trimmer cam connecting rod (21) from the lower thread trimmer cam (22).
14. Remove the retaining ring (23), and then remove the roller (24).
15. Remove the nut (25), and then remove the roller shaft (26) from the lower thread trimmer cam lever (14).

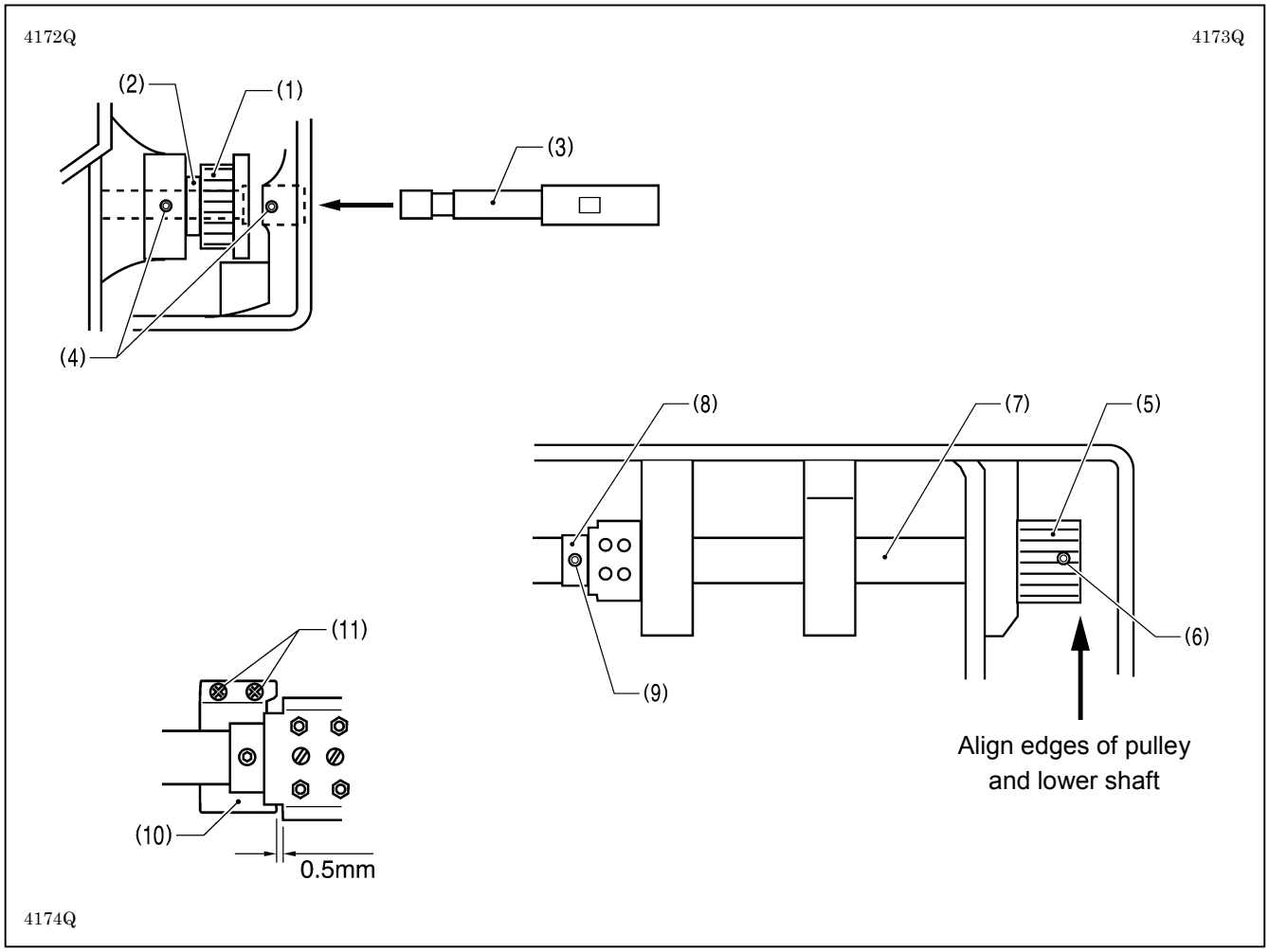
2-24. Lower shaft and idle pulley mechanisms



1. Remove the two screws (1), and then remove the cover (2).
2. Loosen the two set screws (3), and then remove the set screw collar assembly (4) from the lower shaft (5).
3. Loosen the two set screws (6), and then remove the timing pulley assembly (7) from the lower shaft (5).
4. Loosen the two set screws (8), and then remove the shaft (9).
5. Remove the collar (10) and the idle pulley (11).

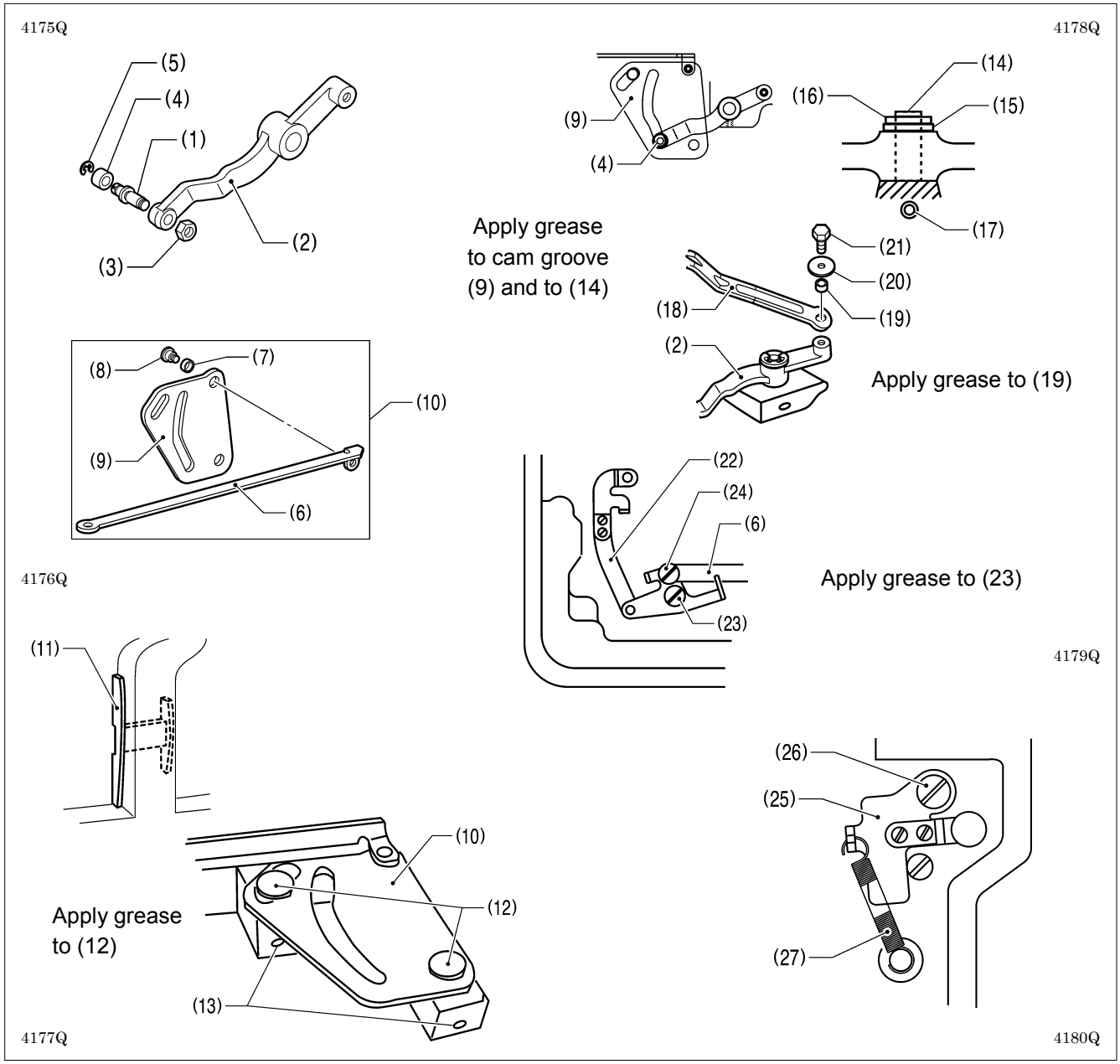
3. ASSEMBLY

3-1. Lower shaft and idle pulley mechanisms



1. After attaching the timing belt to the idle pulley (1), insert the collar (2).
2. Insert the shaft (3) into the bed and tighten the two set screws (4).
3. Install the timing pulley assembly (5) to the lower shaft (7) with the two set screws (6).
4. Place the set screw collar assembly (8) onto the lower shaft (7), and then tighten the two set screws (9) after checking the thrust direction.
   * The screw flat should align with the set screw which comes first when the lower shaft is rotated in the rotation direction.
5. Install the cover (10) with the two screws (11).

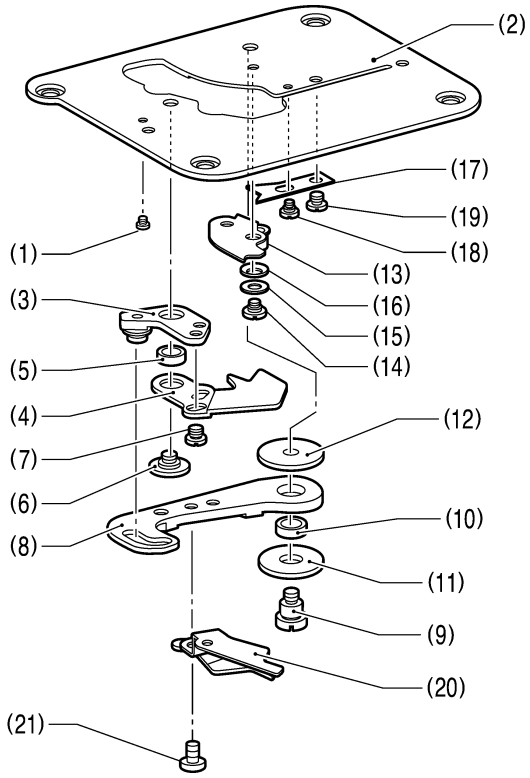
3-2. Lower thread trimmer mechanism (1)



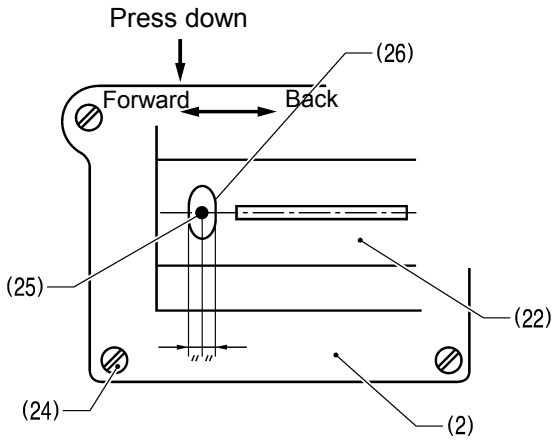
1. Insert the roller shaft (1) into the lower thread trimmer cam lever (2), and tighten the nut (3).
2. Place the roller (4) onto the roller shaft (1), and then install the retaining ring (5).
3. Install the lower thread trimmer cam connecting rod (6) to the lower thread trimmer cam (9) with the driving lever roller (7) and the shoulder screw (8). (Lower thread trimmer cam assembly (10)).
4. Install the cover (11) to the bed.
5. Pass the lower thread trimmer cam assembly (10) through the cover (11) and install it to the bed with the two lever shafts (12).
6. Tighten the two set screws (13) so that the lower thread trimmer cam assembly (10) moves smoothly without any play.
7. Insert the roller (4) into the lower thread trimmer cam (9), and then install it to the bed with the lower thread trimming cam shaft (14), washer (15) and retaining ring (16).
8. Tighten the set screw (17).
9. Connect the presser lifter connecting rod set (18) and the lower thread trimmer cam lever (2) with the spacer (19), the plain washer D (20) and the bolt (21).
10. Install the lower thread trimmer link assembly (22) with the shoulder screw (23).
11. Connect the lower thread trimmer link assembly (22) and the lower thread trimmer cam connecting rod (6) with the shoulder screw (24).
12. Install the opening plate assembly (25) with the shoulder screw (26).
13. Install the plate spring (27) as shown in the illustration.

3-3. Lower thread trimmer mechanism (2)

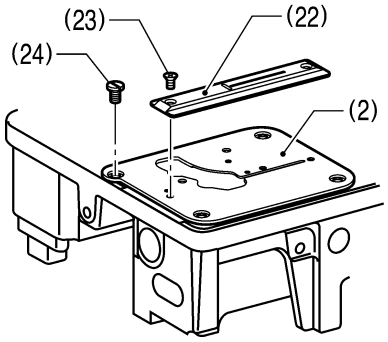
4181Q



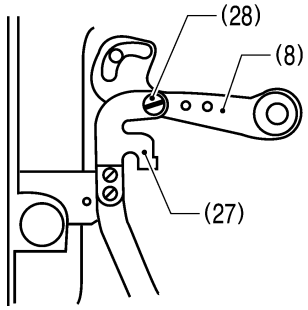
4183Q



Apply grease to cam groove (8) and to (10)



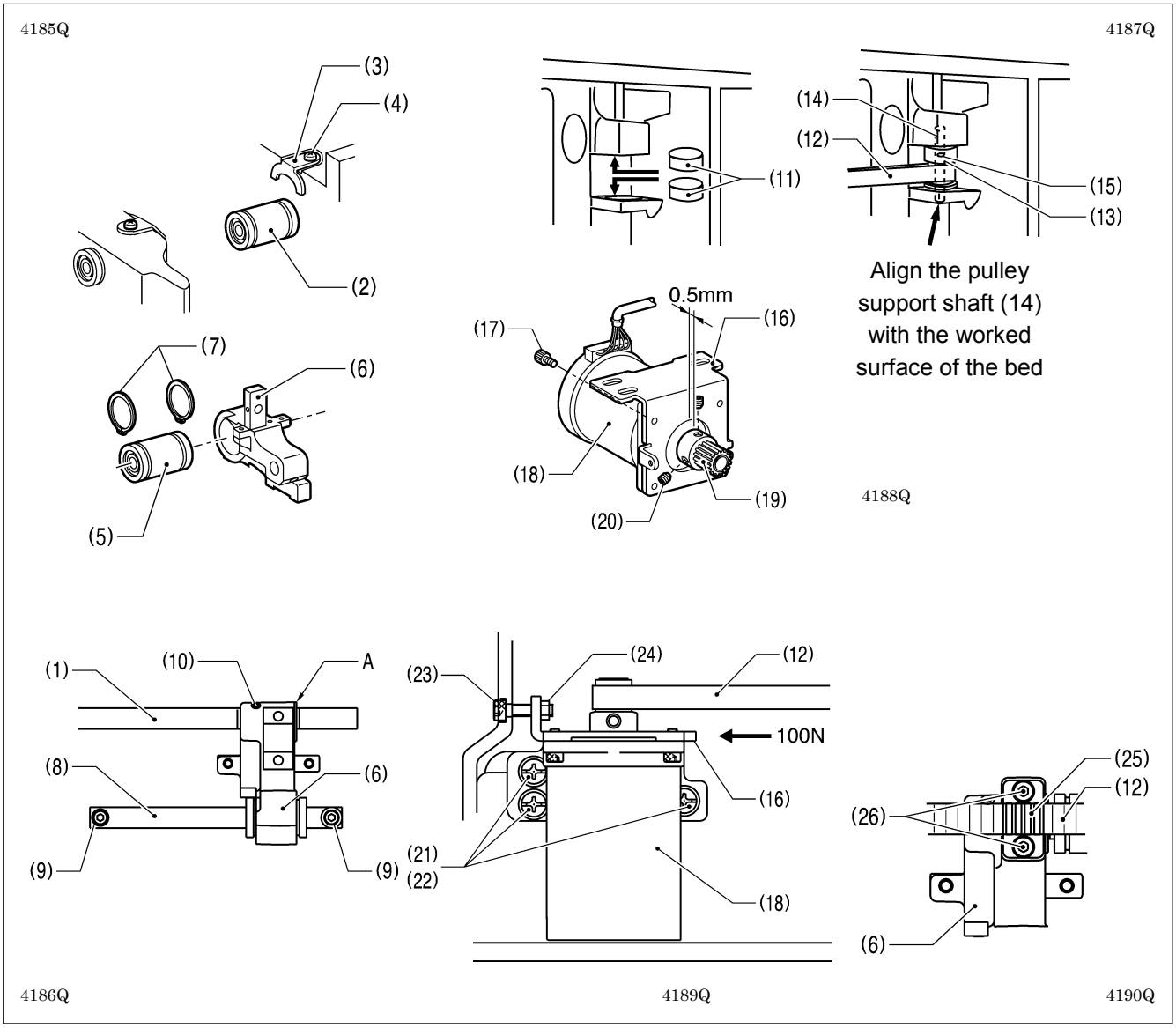
4182Q



4184Q

1. Install the screw (1) to the base plate (2).
2. Install the lever assembly (3) and the lower thread retainer (4) to the base plate (2) with the collar (5) and the screw (6).
3. Install the lower thread retainer (4) to the lever assembly (3) with the two screws (7).
4. Insert the roller of the lever assembly (3) into the cam groove of the knife driving lever (8).
5. Install the knife driving lever (8) to the base plate (2) with the shoulder screw (9), the collar (10), the washer U (11) and the washer D (12).
6. Install the lower thread clamp plate assembly (13) to the base plate (2) with the shoulder screw (14), the plain washer (15) and the washer (16).
7. Install the lower thread presser (17) to the base plate (2) with the shoulder (18) and the screw (19).
8. Install the fixed knife set (20) to the knife driving lever (8) with the two screws (21).
9. Install the needle plate (22) with the two flat screws (23) so that it is parallel to the base plate (2).
10. Provisionally install the base plate (2) to the top of the bed with the four screws (24).
11. While pushing the base plate (2) to the right so that the needle (25) is in the center of the needle hole (26) in the longitudinal direction, securely tighten the four screws (24).
12. Connect the lower thread trimmer link assembly (27) and the knife driving lever (8) with the shoulder screw 4.37 (28).

3-4. Feed mechanism (1)

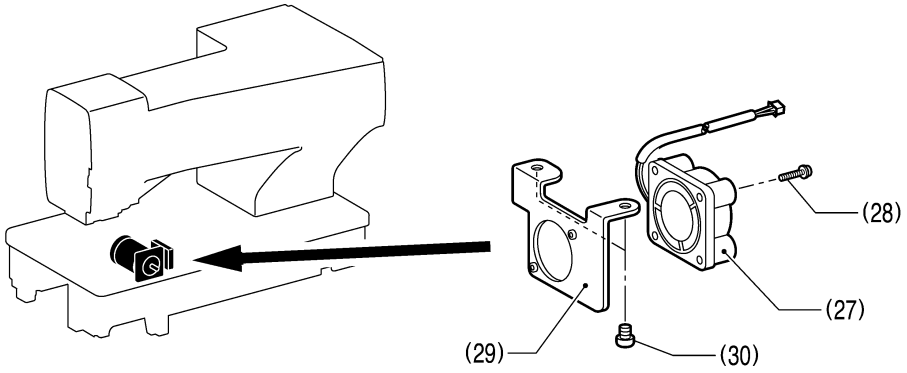


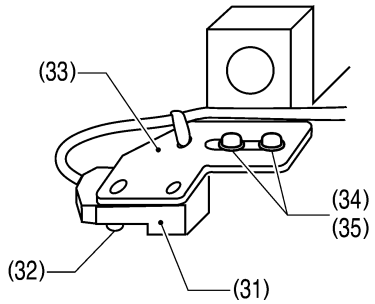
1. Install the two linear bushes (2) for the feed guide shaft B (1) to the bed.
2. Install the two ball bearing stoppers (3) with the two screws (4).
3. Place the linear bush (5) onto the feed arm support (6) and install it with the two retaining rings (7).
4. Pass the feed arm support (6) through the feed guide shaft A (8), and install it provisionally to the bed with the two bolts (9).
5. Pass the feed guide shaft B (1) through the feed arm support (6) and align it with the reference lines A, and then tighten the set screw (10).
6. Tighten the two bolts (9) so that the feed arm support (6) moves smoothly.
7. Install the two ball bearings (11) to the bed.
8. Place the timing belt (12) onto the pulley B assembly (13), and then insert the support shaft (14).
9. Install the pulley B assembly (13) to the support shaft (14) with the two set screws (15).
10. Install the motor mounting bracket (16) to the feed pulse motor (18) with the four bolts (17).
11. Install the pulley A assembly (19) so that there is a gap of 0.5 mm between it and the motor with the two set screws (20).
12. Place the timing belt (12) onto the feed pulse motor (18), and then provisionally tighten it with the three screws (21) and plain washers (22).
13. Push the motor mounting bracket (16) in the direction of the arrow with a force of 100 N, and then tighten the three screws (21).
14. Gently tighten the bolt (23) and the nut (24).

* If there is no tension gauge available, apply a force of 5 N at the middle of the timing belt (12) span and adjust so that the amount of deflection at this time is 3.5 mm.

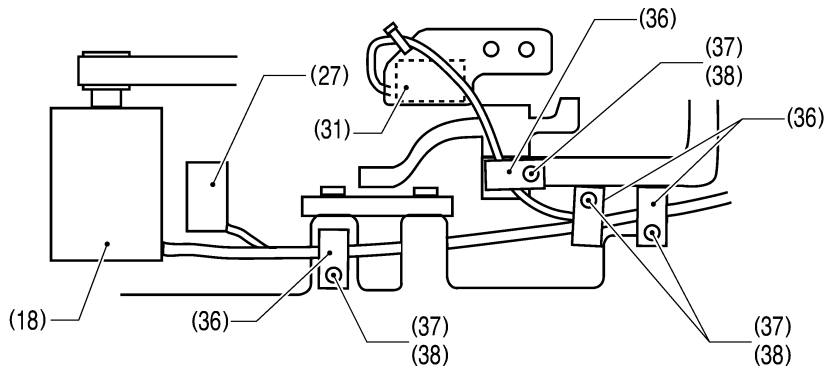
15. Place the belt holder (25) onto the timing belt (12), and then install it to the feed arm (6) with the two bolts (26).

4191Q





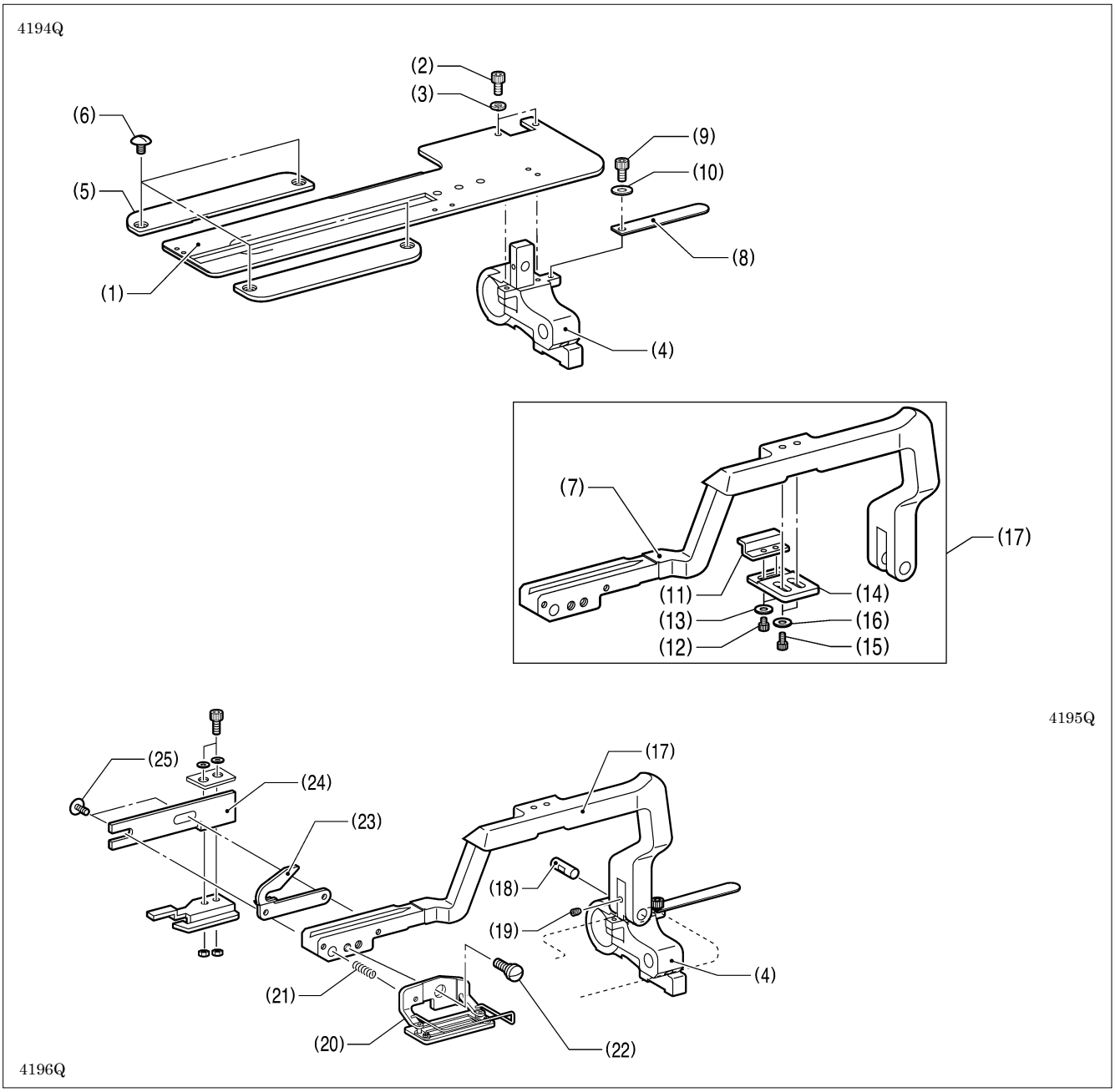
4192Q



4193Q

16. Install the DC fan motor 40 assembly (27) to the feed motor cover (29) with the two screws (28).
17. Install the feed motor cover (29) to the bed with the two screws (30).
18. Install the feed home position sensor (31) to the feed sensor support plate (33) with the screw (32).
19. Install the feed sensor support plate (33) to the bed with the two screws (34) and plain washers (35).
20. Pass the cords for the feed pulse motor (18), DC fan motor 40 assembly (27) and feed home position sensor (31) through the four cord holders (36), and secure to the bed with the four screws (37) and the two plain washers (38).

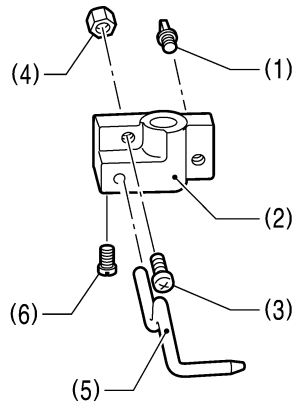
3-5. Feed mechanism (2)



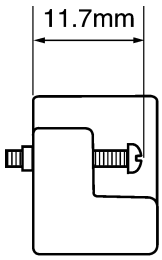
1. Provisionally install the length feed plate (1) to the feed arm support (4) with the two bolts and spring washers (3).
2. Provisionally install the two feed presser plates (5) to the bed with the four screws (6).
3. Tighten the four screws (6) so that the window in the length feed plate (1) is in the center of the needle plate when the feed arm (7) is moved forward and back.
4. Tighten the two bolts (2) so that the feed arm (7) moves smoothly.
5. Install the feed cover (8) to the feed arm support (4) with the bolt (9) and the plain washer (10).
6. Install the cam (11) to the support plate (14) with the two bolts 4.37 X 5 (12) and plain washers (13).
7. Install the support plate (14) to the feed arm (7) with the two bolts (15) and plain washers (16). (Feed arm assembly (17)).
8. Install the feed arm assembly (17) to the feed arm support (4) with the feed arm support shaft (18).
9. Tighten the set screw (19).
10. Insert the spring (21) into the work clamp assembly (20), and then install the work clamp assembly (20) to the feed arm assembly (17) with the shoulder screw (22).
11. Install the feed arm support (23) and the opening cam assembly (24) to the feed arm assembly (17) with the to screws (25).

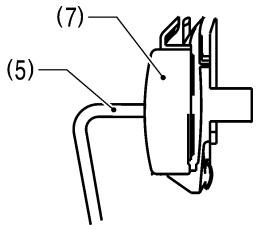
3-6. Bobbin presser mechanism

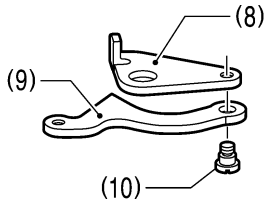
4197Q

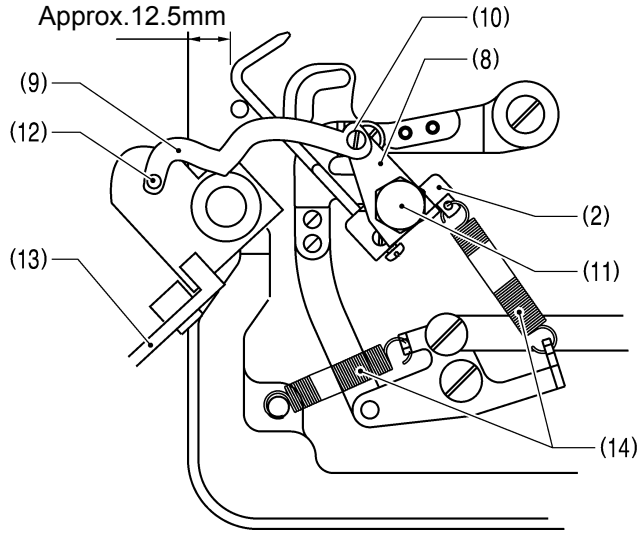


4198Q







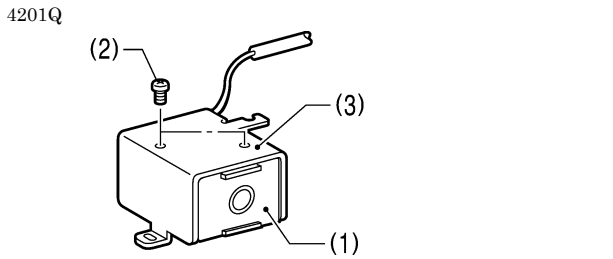


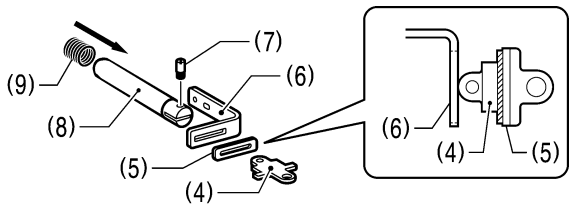
4199Q

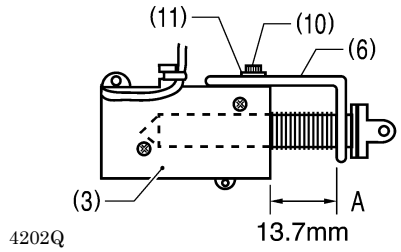
4200Q

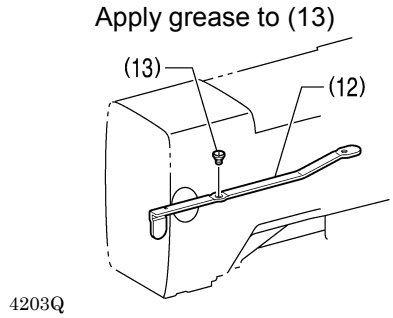
1. Install the spring hook U (1) to the bobbin presser bracket (2).
2. Install the screw (3) and nut (4) to the bobbin presser bracket (2).
   * At this time, install the screw (3) so that the length shown in the illustration is 11.7 mm.
3. Install the bobbin presser (5) to the bobbin presser bracket (2) with the set screw (6).
   * At this time, install so that the end of the bobbin presser (5) is at the center of the bobbin case (7).
4. Install the auxiliary plate (8) and the opening plate (9) with the shoulder screw (10).
5. Install the bobbin presser bracket (2) and the auxiliary plate (8) to the bed with the shoulder screw (11).
6. Install the opening plate (9) to the rotary hook cover (13) with the shoulder screw (12).
7. Attach the two extension springs (14).
8. Turn on the power, and after the sewing machine returns to the home position, turn the screw (3) and the nut (4) to adjust so that the clearance between the bobbin presser (5) and the edge of the bed is approximately 12.5 mm.

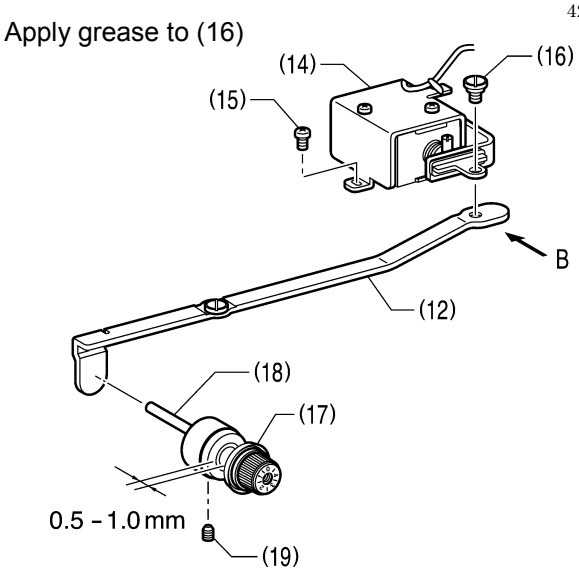
3-7. Tension release mechanism (1)

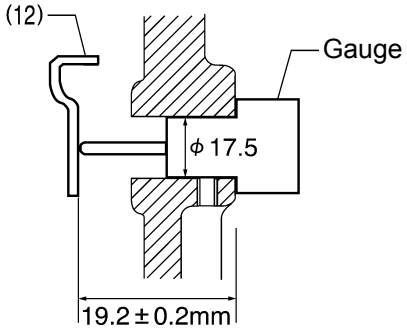












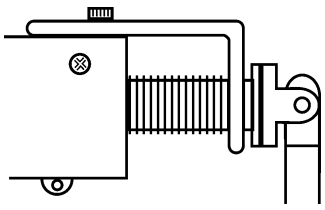
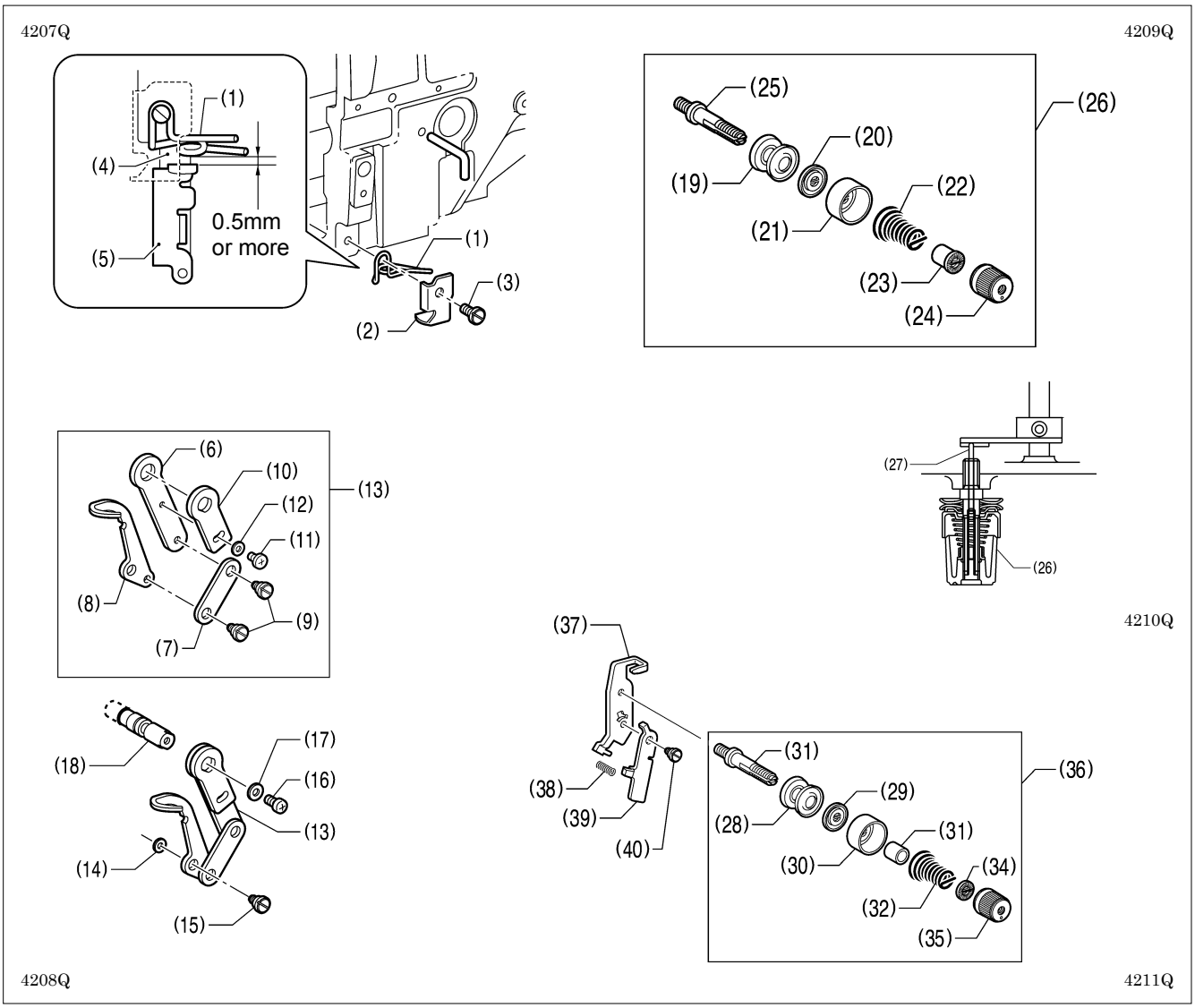


Figure C

1. Install the tension release solenoid (1) to the solenoid holder (3) with the two screws (2).
2. Pass the tension release solenoid link (4) through the tension release rubber assembly (5) and the plate (6) as shown in the illustration, and then install it to the plunger (8) with the plunger pin (7).
3. Install the spring (9) to the plunger (8).
4. Insert the plunger (8) into the tension release solenoid (1), and then install the plate (6) to the solenoid holder (3) with the bolt (10) and the washer (11) so that the dimension A is 13.7 mm.
5. Insert the tension release link (12) into the arm from the face plate side, and install it with the shoulder screw (13).
6. Provisionally install the tension release solenoid assembly (14) with the two screws (15).
7. Connect the tension release solenoid assembly (14) and the tension release link (12) with the shoulder screw (16).
8. Adjust the position of the tension release solenoid assembly (14) using a gauge so that the tension release link (12) protrudes from the edge of the tension stud bracket assembly (17) on the arm by 19.2 ± 0.2 mm, and then tighten the two screws (15).
9. Insert the tension release pin (18) into the tension stud bracket assembly (17), and then insert it into the arm.
10. Tension the set screw (19) so that the tension discs are open by 0.5 to 1.0 mm when the tension release link (12) is pushed in the direction of the arrow B.

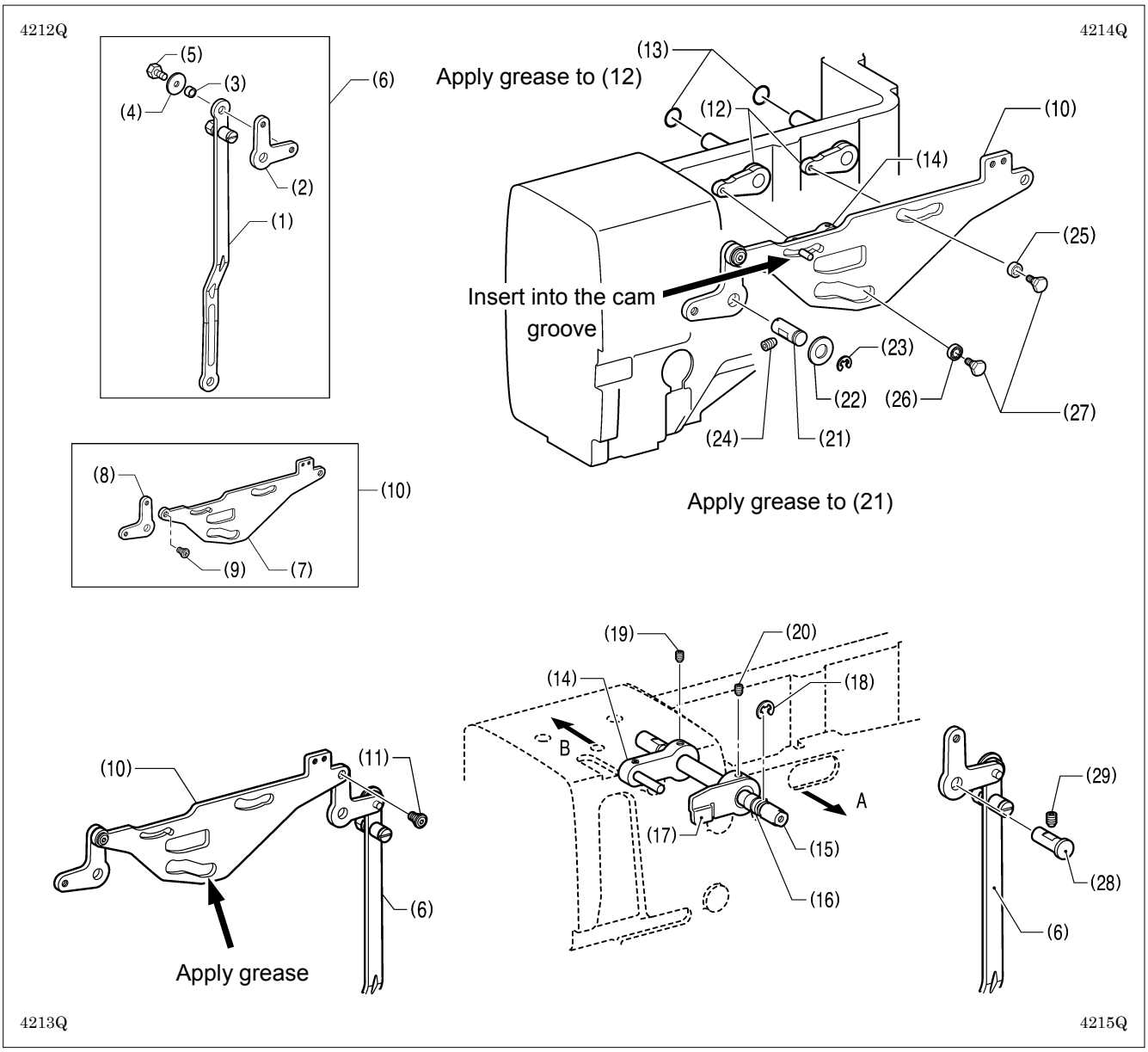
* If not using a gauge, insert the tension release pin (18) into the tension stud bracket assembly (17), and insert it into the arm, and then tighten the set screw (19) at almost the center of the screw stop on the tension stud bracket assembly (17).
With the tension release link (12) pushed in the direction of the arrow B (Figure C), move the tension release solenoid assembly (14) so that the tension discs are open by 0.5 to 1.0 mm, and then tighten the two screws (15).

3-8. Tension release mechanism (2)



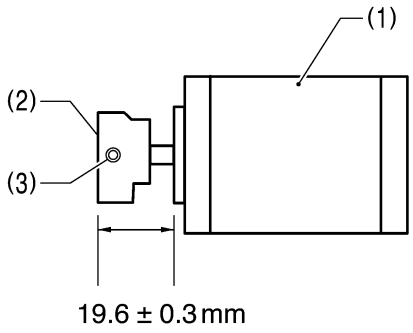
1. Press the thread guide cover (2) on the arm thread guide L (1), and provisionally tighten the screw (3).
2. (After installing the needle bar thread guide by referring to "3-18. Needle bar and thread take-up mechanisms (2)"), tighten the screw (3) to adjust the gap between the needle bar thread guide (5) and arm thread guide L (1) to 0.5 mm or more when the needle bar (4) is at its highest point at the maximum right zigzag position (3 mm).
3. Connect the adjusting lever (6), lever link (7) and tension take-up lever (8) with the two shoulder screws (9).
4. Install the lever (10) to the adjusting lever (6) with the screw (11) and the washer (12). (Tension take-up lever assembly (13))
5. Insert the washer (14) into the bottom of the tension take-up lever assembly (13), and then install it to the arm with the shoulder screw (15).
6. Install the tension take-up lever assembly (13) to the tension release shaft (18) with the screw (16) and the washer (17).
7. Place the two tension discs (19), tension disc pressers (20) and (21), tension adjusting spring (22), washer (23) and tension nut (24) onto the sub tension stud (25). (Sub thread tension assembly (26))
8. Insert the tension release pin (27) into the sub thread tension assembly (26), and then install it to the arm.
   * Adjust the thread tension while referring to “4-18. Adjusting the thread tension at the tack tension control”.
9. Place the two tension discs (28), tension disc pressers (29) and (30) onto the tension stud (31), and then place the collar (32) onto the tension stud (31) as far in as it will go.
10. Place the tension spring (33) and the washer (34) onto the tension stud (31), and then tighten the tension nut (35). (Tension stud assembly (36))
11. Provisionally install the tension release lever bracket (37) to the tension stud assembly (36).
12. Attach the spring (38).
13. Install the tension release lever (39) with the shoulder screw (40).
14. Fully tighten the tension stud assembly (36).

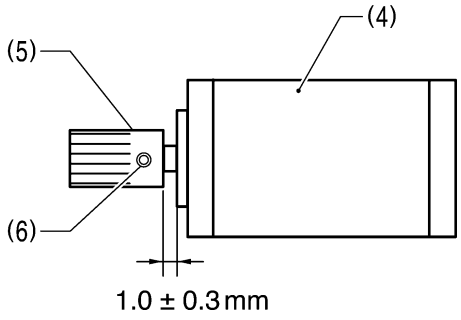
3-9. Presser lifter mechanism (1)



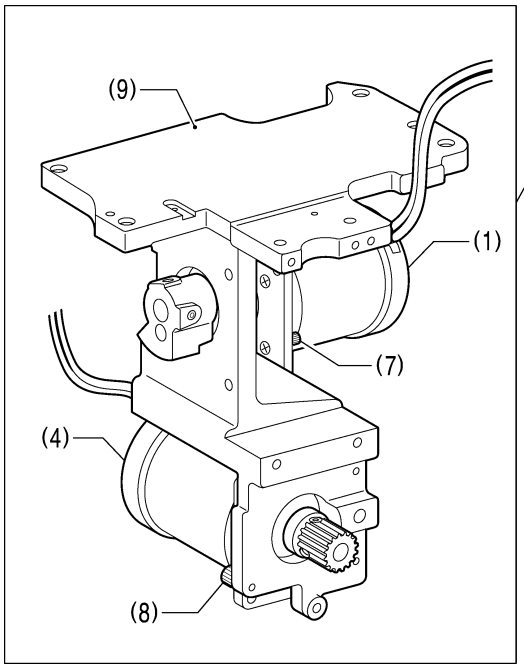
1. Install the presser lifter connecting rod assembly (1) and the knee lifter lever (2) with the spacer (3), the washer D (4) and the bolt (5). (Presser lifter connecting rod set (6))
2. Install the driving link (7) and the knee lifter lever (8) with the shoulder screw (9). (Lifter lever assembly (10))
3. Install the presser lifter connecting rod set (6) and the lifter lever assembly (10) with the shoulder screw (11).
4. Insert the two trimmer driving levers (12) to the inside of the arm.
5. Pass the two O-rings (13) into the shafts of trimmer driving levers (12) from the outside of the arm, and fit them into the hollow in the arm.
6. Insert the pin of the tension release driving lever (14) into the cam grove in the lifter lever assembly (10), and then insert into the arm.
7. Install the O-ring (16) to the tension release shaft (15), and then insert into the arm.
8. Insert the tension release cam (17) into the tension release shaft (15). Pass the tension release shaft (15) through the tension release driving lever (14), and install the retaining ring (18).
9. While pushing the tension release shaft (15) in the direction of the arrow A, and also pushing the tension release driving lever (14) in the direction of the arrow B, tighten the set screw (19) on the screw flat of the tension release shaft (15).
10. Install the tension release cam (17) with the set screw (20).
11. Install the lifter lever assembly (10) using the lifter shaft (21), plain washer (22) and retaining ring (23) to the arm, and then tighten the set screw (24).
12. Install the driving lever roller (25) and the ball bearing (26) to the trimmer driving levers (12) with the two shoulder screws (27).
13. Install the presser lifter connecting rod set (6) to the arm with the lifter shaft A (28) and the set screw (29).

3-10. Presser lifter mechanism (2)





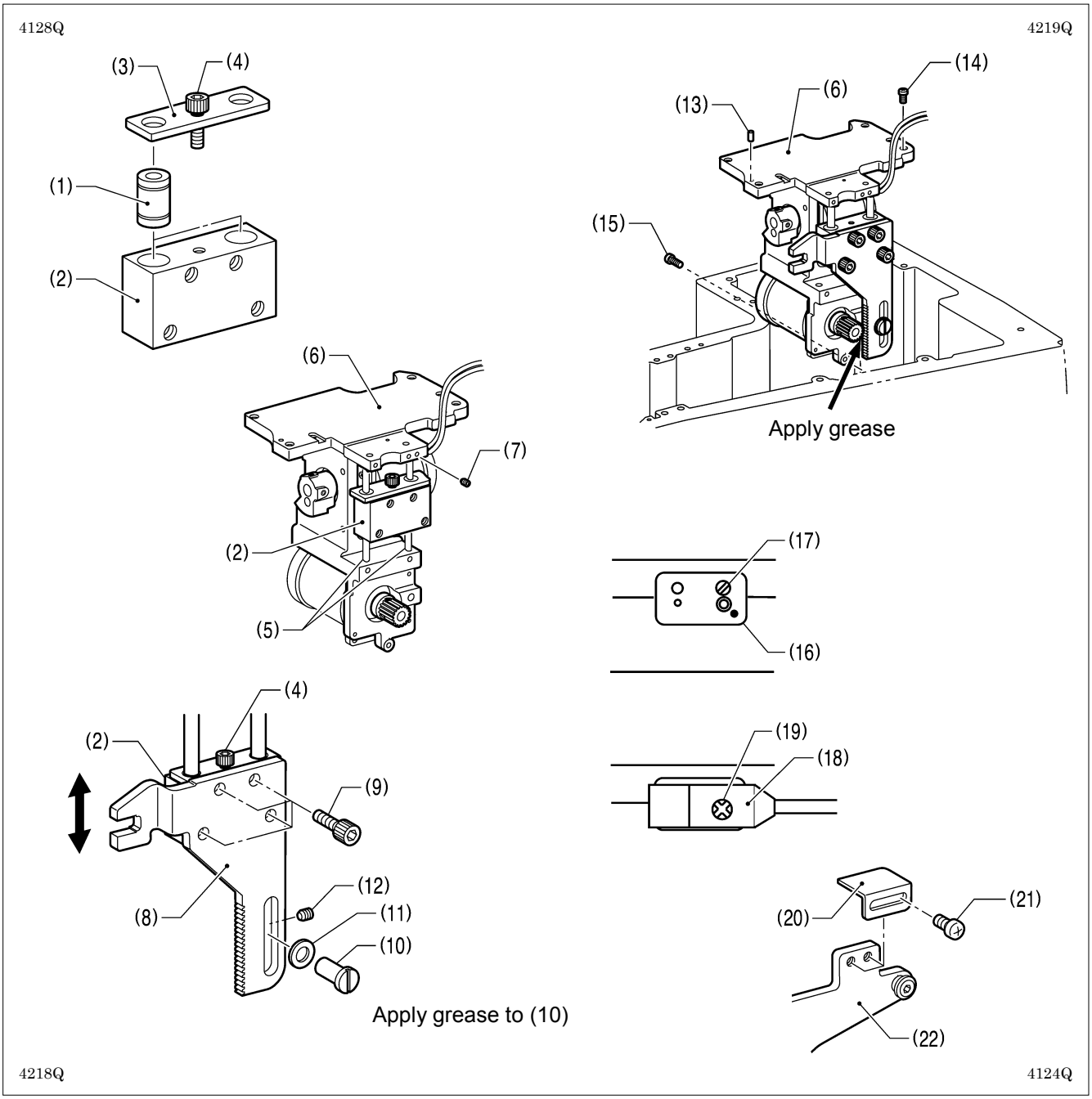
4216Q



4217Q

1. Install the motor lever (2) to the pulse motor N assembly (for needle zigzag) (1) with the two set screws (3) so that the dimensions are as shown in the illustration.
2. Install the gear (5) to the pulse motor FT assembly (for presser lifter) (4) with the two set screws (6) so that the dimensions are as shown in the illustration.
3. Install the pulse motor N assembly (for needle zigzag) (1) and the pulse motor FT assembly (for presser lifter) (4) to the motor bracket (9) with the four bolts (7) and the three bolts (8) so that the directions of the cords are as shown in the illustration. (Motor bracket assembly (10))

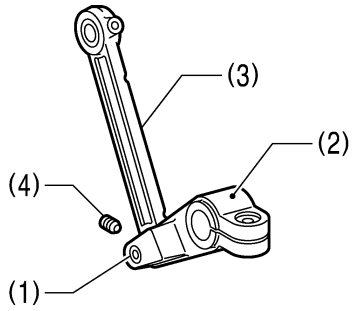
3-11. Presser lifter mechanism (3)



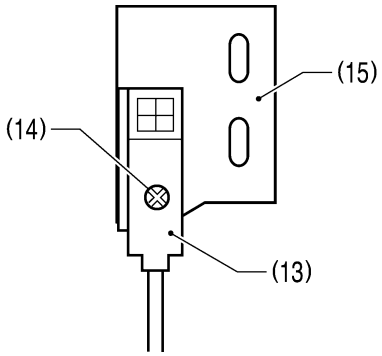
1. Insert the two linear ball bearings (1) into the guide bracket (2).
2. Provisionally install the bearing holder (3) with the bolt (4).
3. Pass the two guide shafts (5) through the motor bracket assembly (6) and the guide bracket (2), and then tighten the four set screws (7).
4. Provisionally install the presser driving arm (8) to the guide bracket (2) with the four bolts (9).
5. Securely tighten the bolt (4).
6. Insert the washer (11) into the driving arm presser (10), and then pass it through the presser driving arm (8) and insert into the motor bracket assembly (6). Provisionally tighten the set screw (12).
7. Tighten the four bolts (9) and the set screw (12) so that the presser driving arm (8) moves up and down easily and so that there is no play in the gear.
8. Insert the motor bracket assembly (6) into the arm from the top.
9. Position the motor bracket assembly (6) using the two positioning pins (13), and then install it by tightening the four screws (14) and the screw (15).
10. Install the clamp sensor plate (16) with the flat screw (17).
11. Install the clamp sensor (18) with the screw (19).
12. Install the clamp sensor dog (20) to the upper thread trimmer driving link (22) with the two screws (21).

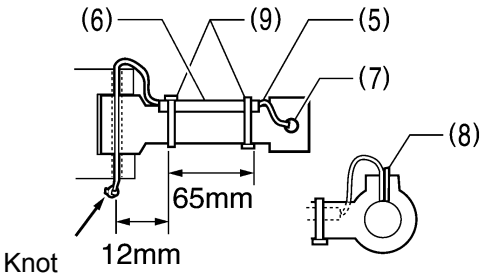
3-12. Needle zigzag mechanism

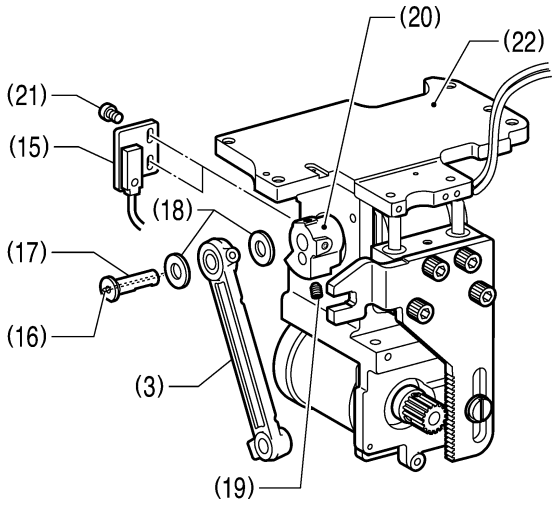
4220Q

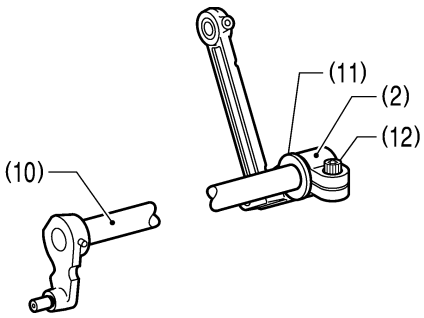


4222Q







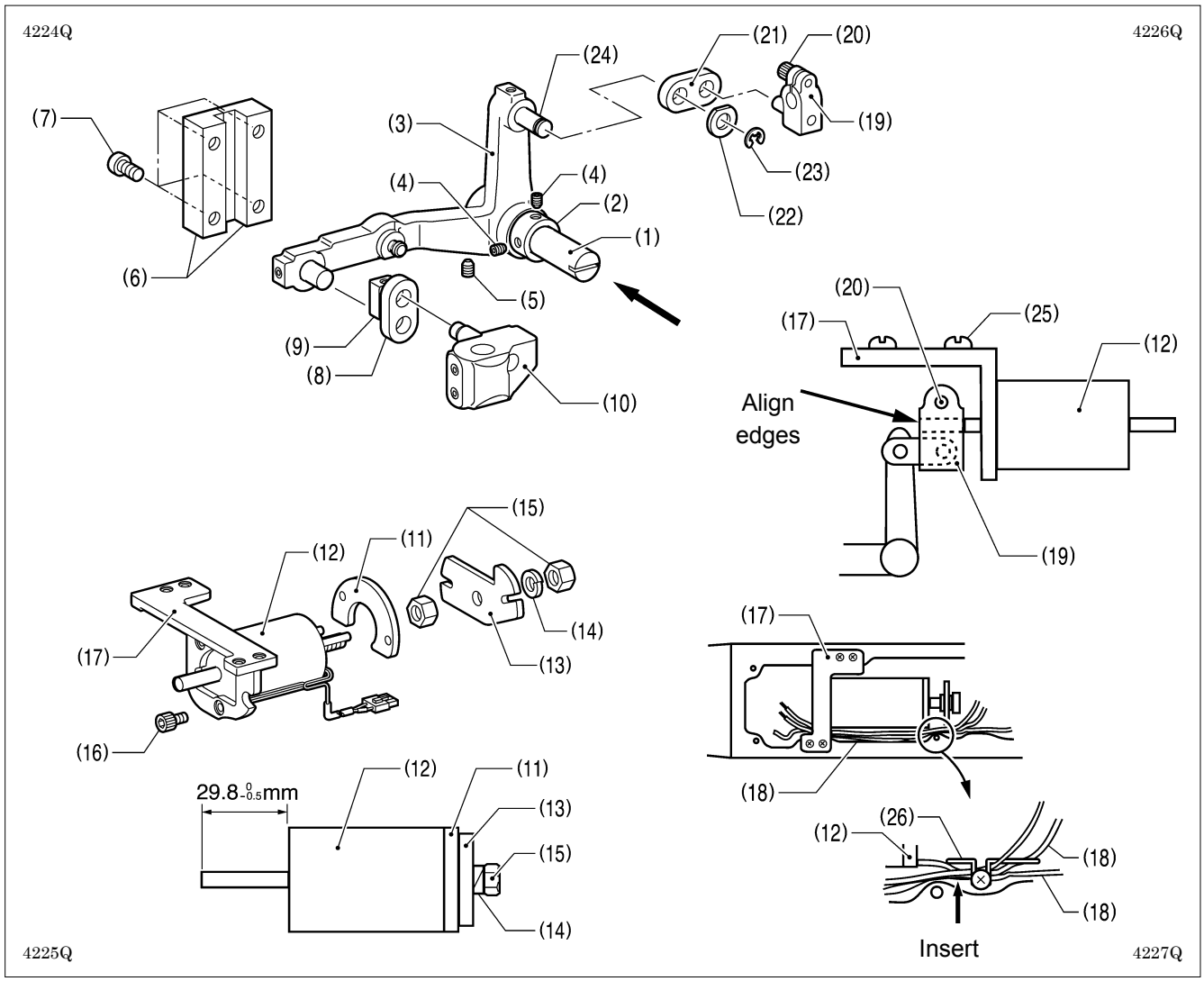


4221Q

4223Q

1. Pass the zigzag connecting rod shaft (1) through the zigzag lever (2) and the zigzag connecting rod (3), and then tighten the set screw (4).
2. Pass the wick (5) through the zigzag connecting rod shaft (1) and the oil tube (6), and then push it into the lubricating hole (7).
3. Push the felt (8) into the lubricating hole (7) to prevent the oil tube (6) from coming out.
4. Install the two fastening bands (9) so that they face in the position shown in the illustration.
5. Pass the zigzag lever assembly F (10) through the arm, and position it in the thrust direction using the thrust washer (11) and the zigzag lever (2).
6. Secure the zigzag lever assembly F (10) by tightening the bolt (12).
7. Install the sensor (13) to the zigzag sensor plate (15) with the screw (14).
8. Insert the wick (16) into the motor lever shaft (17).
9. Pass the motor lever shaft (17) through the zigzag connecting rod (3) and the two washers (18) so that the screw stop is aligned correctly, and then secure to the motor lever (20) by tightening the set screw (19).
10. Install the zigzag sensor plate (15) to the motor bracket (22) with the two screws (21) so that each screw is in the middle of the slot.

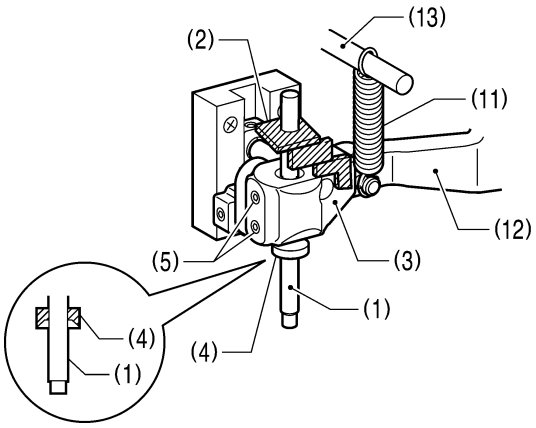
3-13. Cutter mechanism (1)



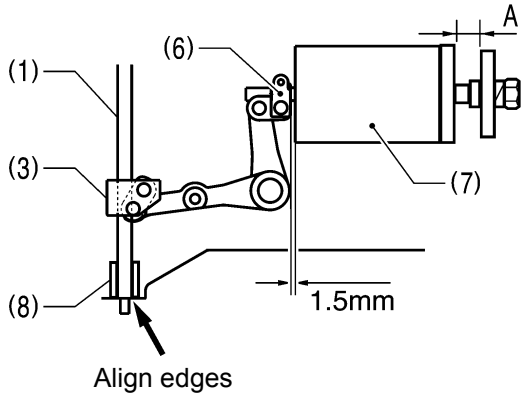
1. Pass the cutter driving arm shaft (1) through the set screw collar (2) and the cutter driving arm assembly (3) in the direction shown in the illustration.
2. Secure the set screw collar (2) with the two set screws (4) so that the screw stops are aligned correctly.
3. Install the cutter driving arm assembly (3) with the set screw (5) so that there is no play in the thrust direction and so that there is no gap.
4. Provisionally install the two cutter bar guides (6) with the four screws (7).
5. Install the cutter driving link (8) and the needle bar bracket slide block (9) to the driving shaft holder assembly (10).
6. Install the cutter driving link (8) to the cutter driving arm assembly (3).
7. Tighten the four screws (7) so that the needle bar bracket slide block (9) moves up and down easily without play.
8. Install the stopper cushion (11) to the cutter solenoid (12). (It is installed at the time of shipment from the factory.)
9. Install the solenoid stopper (13) to the solenoid plunger with the spring washer (14) and the two nuts (15) as shown in the illustration.
10. Install the cutter solenoid (12) to the cutter solenoid bracket (17) with the three bolts (16).
    * At this time, install so that the oil tube (18) passes underneath the cutter solenoid bracket (17).
11. Provisionally tighten the bolt (20) to the cutter link bracket assembly (19).
12. Install the cutter driving link (21) to the cutter link shaft (24) with the washer (22) and the retaining ring (23).
13. Insert the shaft of the cutter link bracket assembly (19) to the hole in the cutter driving link (21).
14. Insert the solenoid plunger into the cutter link bracket assembly (19), and then tighten the bolt (20) so that the end of the solenoid plunger is aligned with the edge of the cutter link bracket assembly (19).
15. Install the cutter solenoid bracket (17) to the arm with the four screws (25).
16. Check that the plunger of the cutter solenoid (12) moves easily.
17. Insert the oil tube (18) and the cord of the cutter solenoid (12) in between tube support U (26) and the arm.

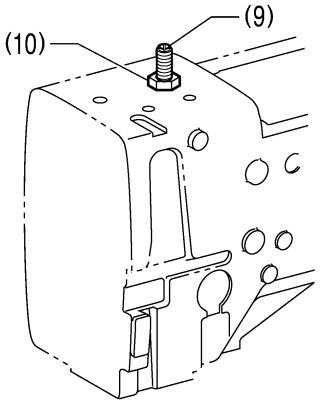
3-14. Cutter mechanism (2)

4228Q

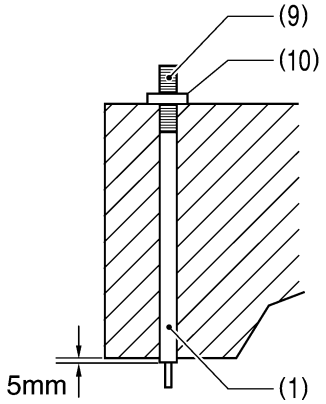


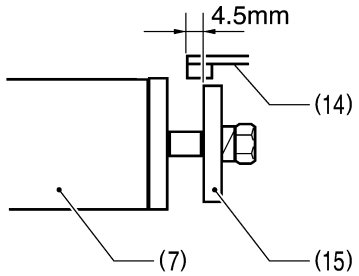
4229Q

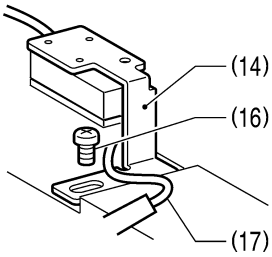




4230Q



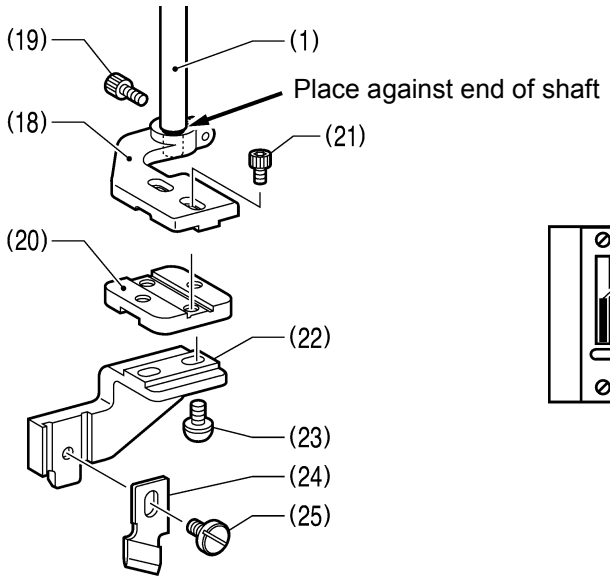




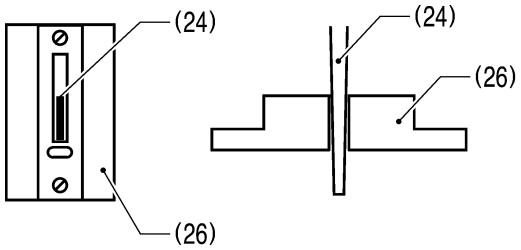
4231Q

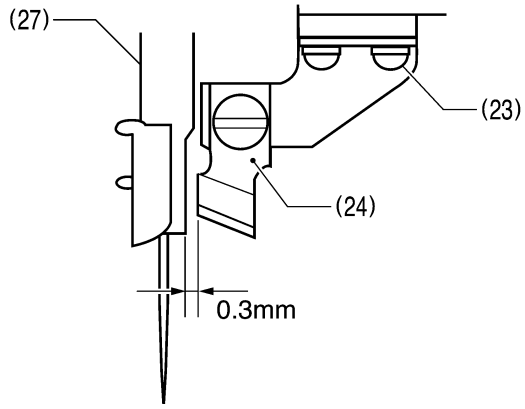
1. Insert the cutter driving shaft (1) into the arm from the top, and then pass it through the holes in the felt (2) and the driving shaft holder assembly (3).
2. Pass the cutter driving shaft (1) through the oil rejector (4).
3. Provisionally secure the driving shaft holder assembly (3) with the two set screws (5).
4. Fully tighten the two set screws (5) so that the edges of the cutter driving shaft (1) and the bush (8) are aligned when the clearance between the edges of the cutter link bracket assembly (6) and the cutter solenoid (7) is 1.5 mm (or when dimension A is 15.5 mm).
5. Install the adjusting screw assembly (9) to the arm, and secure it with the nut (10) so that the stepped section of the cutter driving shaft (1) protrudes by 5 mm from the processed surface of the arm jaw.
6. Attach the spring (11) to the cutter driving arm assembly (12) and the tension release shaft (13).
7. Install the cutter sensor assembly (14) with the screw (16) so that the clearance between the cutter sensor assembly (14) and the solenoid stopper (15) is 4.5 mm.
   * At this time, be careful not to clamp the wick (17).

4232Q

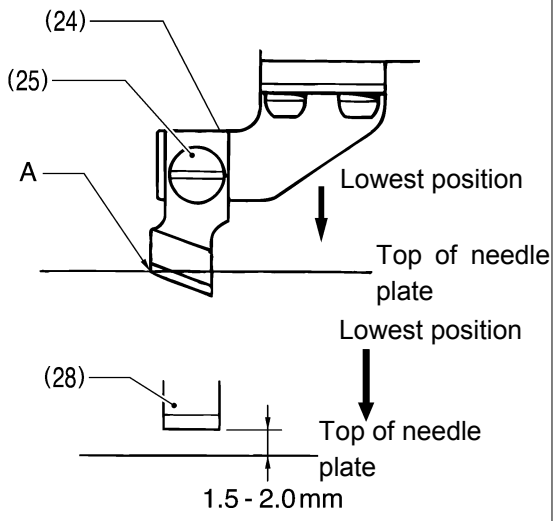


4233Q





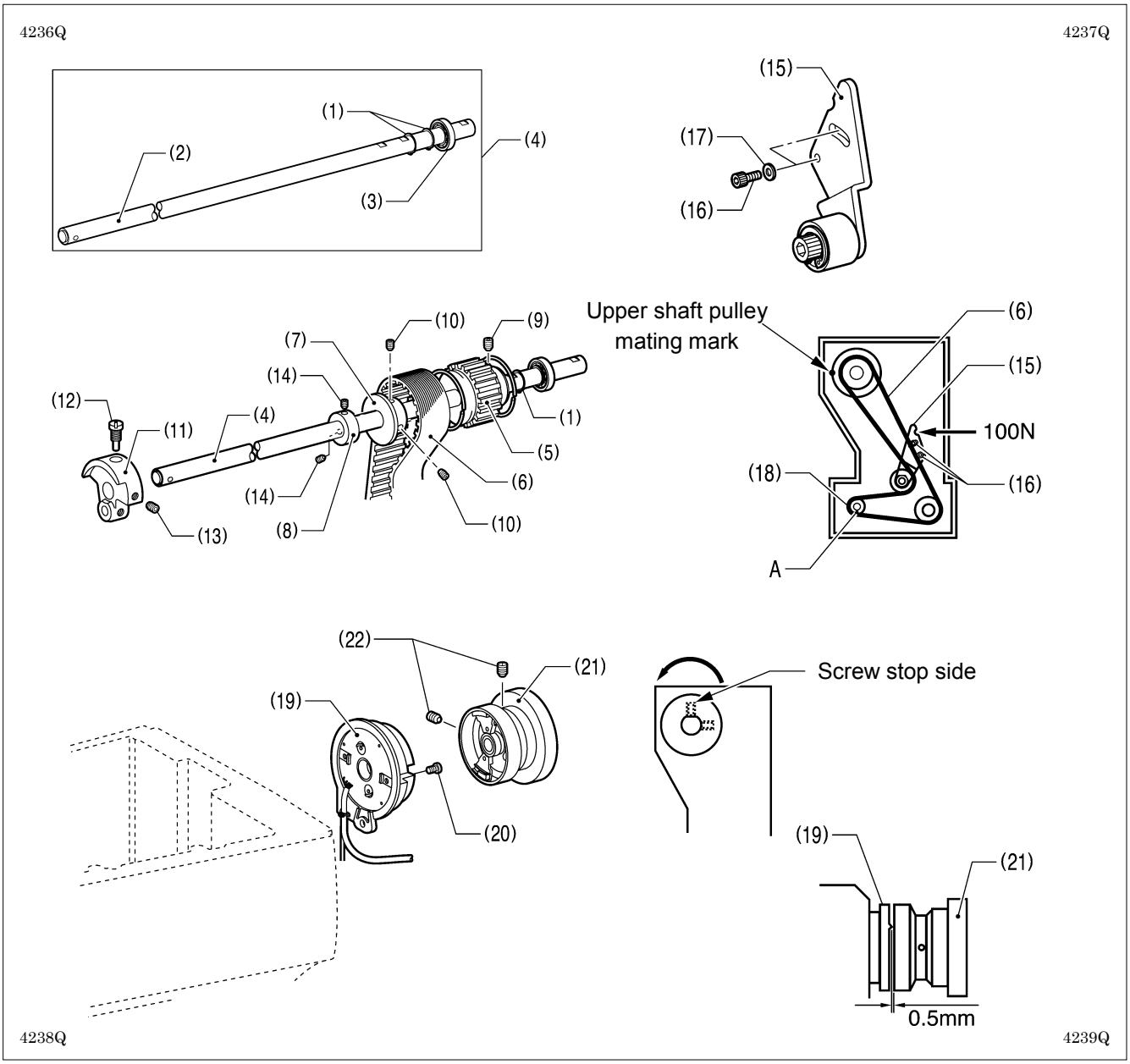
4234Q



4235Q

8. Provisionally install the cutter holder (18) to the cutter driving shaft (1) with the bolt (19).
9. Provisionally install the cutter holder M (20) to the cutter holder (18) with the two bolts (21).
10. Provisionally install the cutter holder DL (22) to the cutter holder M (20) with the two screws (23).
11. Provisionally install the cutter (24) to the cutter holder DL (22) with the screw (25).
12. Fully tighten the bolts (19) and (21) so that the cutter (24) is in the center of the cutter groove in the needle plate (26) when the cutter is lowered.
13. Tighten the two screws (23) so that the distance between the needle bar (27) and the cutter (24) is 0.3 mm.
14. Install the cutter (24) with the screw (25) so that the tip A of the cutter blade is aligned with the top of the needle plate when the cutter is pressed down by hand to its lowest position.
    If using the flat cutter (28), install with the screw (25) so that there is a clearance of 1.5 - 2.0 mm between the cutter and the top of the needle plate.

3-15. Upper shaft and tension pulley mechanism

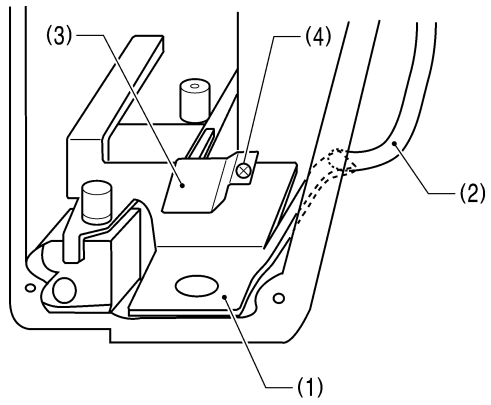


1. Install the two retaining rings (1) to the upper shaft (2).
2. Press-fit the ball bearing (3) as far as the retaining rings (1). (Upper shaft assembly (4))
3. Place the timing pulley U assembly (5), timing belt (6), bobbin winder pulley (7) and set screw collar assembly (8) onto the upper shaft assembly (4).
4. While pushing the timing pulley U assembly (5) against the retaining rings (1), secure it by tightening the two set screws (9).
5. While pushing the bobbin winder pulley (7) against the timing pulley U assembly (5), secure it by tightening the two set screws (10).
6. Install the thread take-up crank (11) to the upper shaft assembly (4) with the screw (12) and the set screw (13).
7. Secure the set screw collar assembly (8) to the upper shaft assembly (4) using the thread take-up crank (11) and the two set screws (14) so that there is no play.
8. Provisionally install the tension pulley assembly (15) with the two bolts (15) and plain washers (17).
9. After installing the needle bar in “3-18. Needle bar and thread take-up mechanism (2)”, set the phase between the upper shaft and the lower shaft so that the mating mark A on the lower shaft timing pulley (18) is facing straight down when the upper shaft assembly (4) is at the needle up stop position.
10. While pushing the tension pulley assembly (15) with a force of 100 N, secure it by tightening the two bolts (16).
11. Install the synchronizer assembly (19) to the arm with the two screws (20).
12. Install the pulley assembly (21) with the two set screws (22) so that the screw flat should align with the set screw which comes first when the lower shaft is rotated in the rotation direction, and so that the clearance between it and the synchronizer assembly (19) is 0.5 mm.

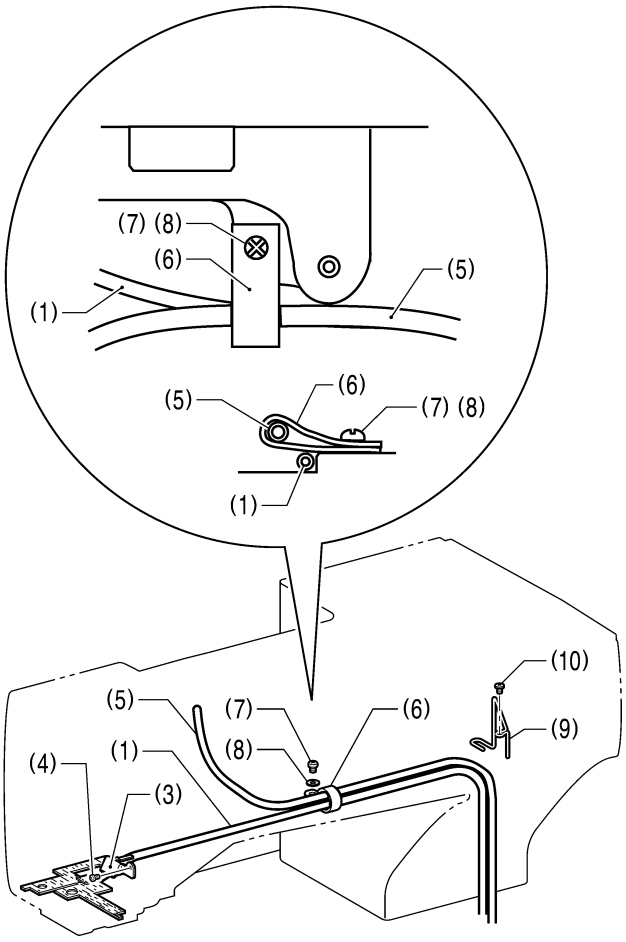
3-16. Lubrication mechanism (1)

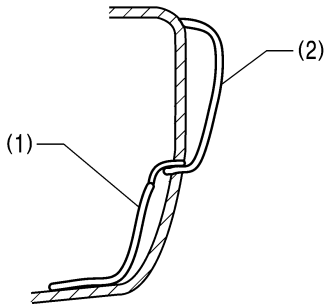
3-16-1. Oil tubes

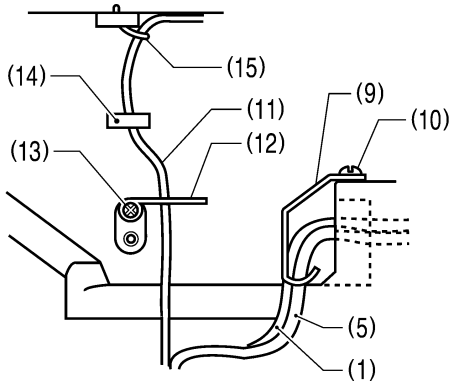
4240Q



4241Q





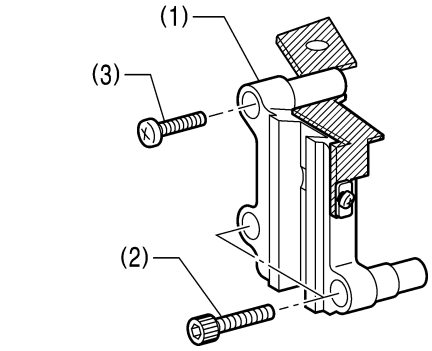


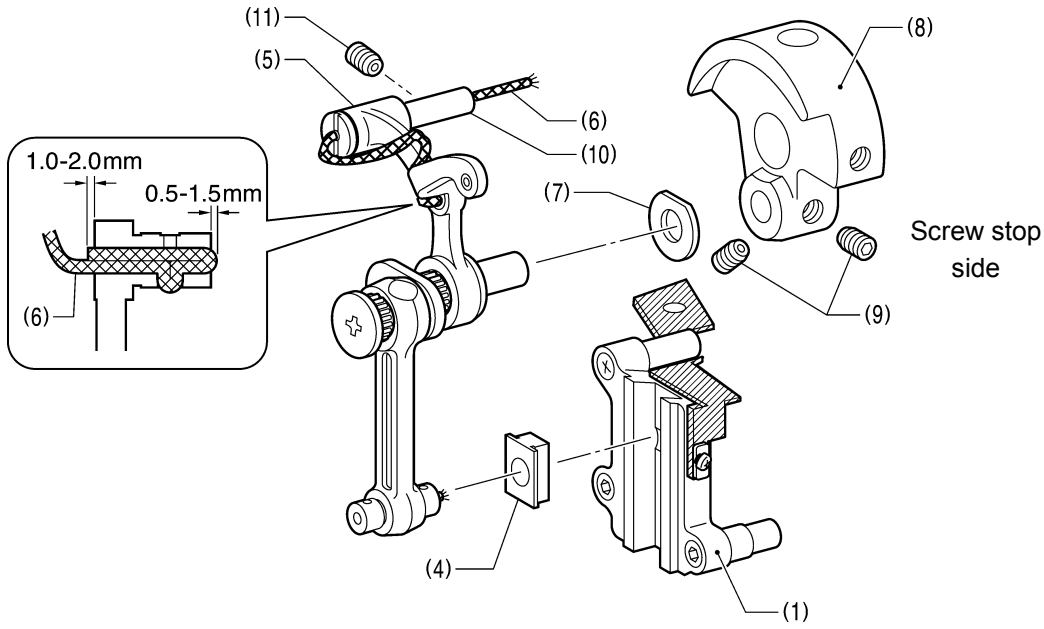
4242Q

1. Insert the oil tube assembly (1) into the arm, and then insert it into the hole in the thread take-up cover (2).
2. Install the felt holder (3) with the screw (4), and then secure the oil tube assembly (1).
3. Install the oil tube (5) that is connected between the oil terminal and the oil outlet with the cord holder (6), screw (7) and washer (8).
4. Clamp the oil tube assembly (1) under the cord holder (6).
5. Install the tube support (9) with the screw (10), and then secure the oil assembly (1) and the oil tube (5) that is connected between the oil terminal and the oil outlet so that they do not touch the pulse motor (for presser lifter).
6. Install the oil tube (11) that is connected to the oil terminal and the plunger pump with the tube support M (12) and the screw (13), pass it through the arm hole (14), and then secure it to the arm with the fastening band (15).
   * At this time, bind the oil tube carefully so as not to break it.

3-17. Needle bar and thread take-up mechanisms (1)

4243Q



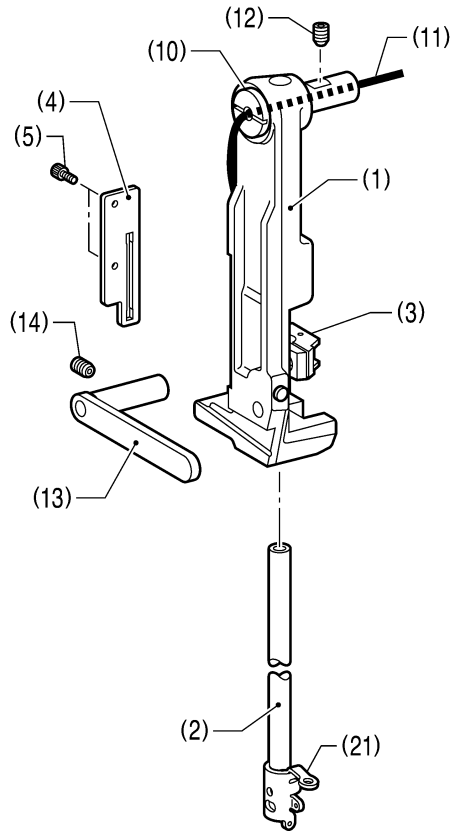


4244Q

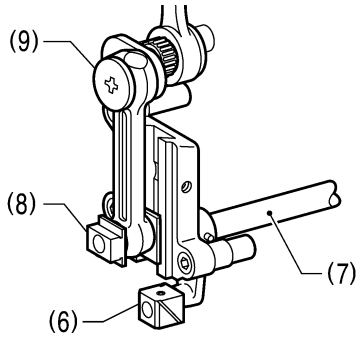
1. Install the crank rod guide (1) with the two bolts (2) and the screw (3).
2. Install the needle bar bracket slide block (4) to the thread take-up lever set (5).
3. Pass the wick (6) through the support shaft hole in the arm and the thread take-up support hole as shown in the illustration.
4. Insert the washer (7) into the thread take-up lever set (5), and then install it to the thread take-up crank (8).
5. Insert the needle bar bracket slide block (4) into the groove in the crank rod guide (1).
6. Secure the thread take-up crank (8) by tightening the two set screws (9).
7. Insert the support shaft (10) and secure it by tightening the set screw (11) so that the thread take-up moves smoothly with no play.

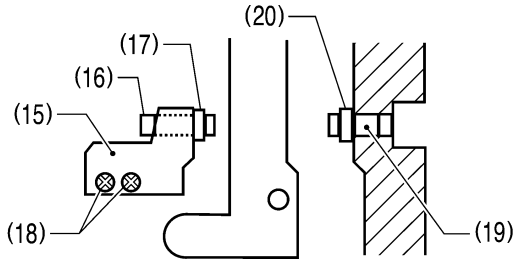
3-18. Needle bar and thread take-up mechanisms (2)

4245Q



4246Q

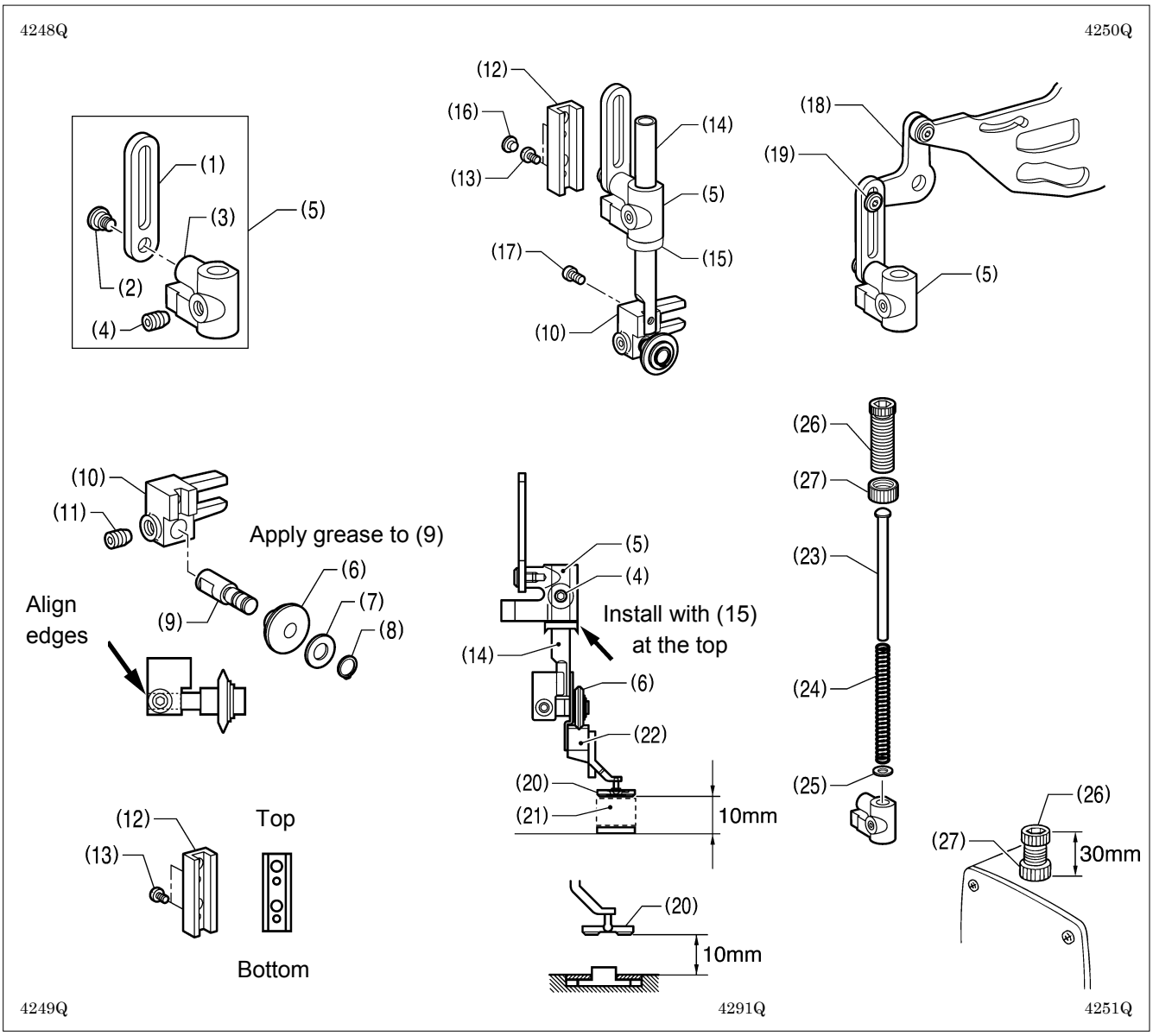




4247Q

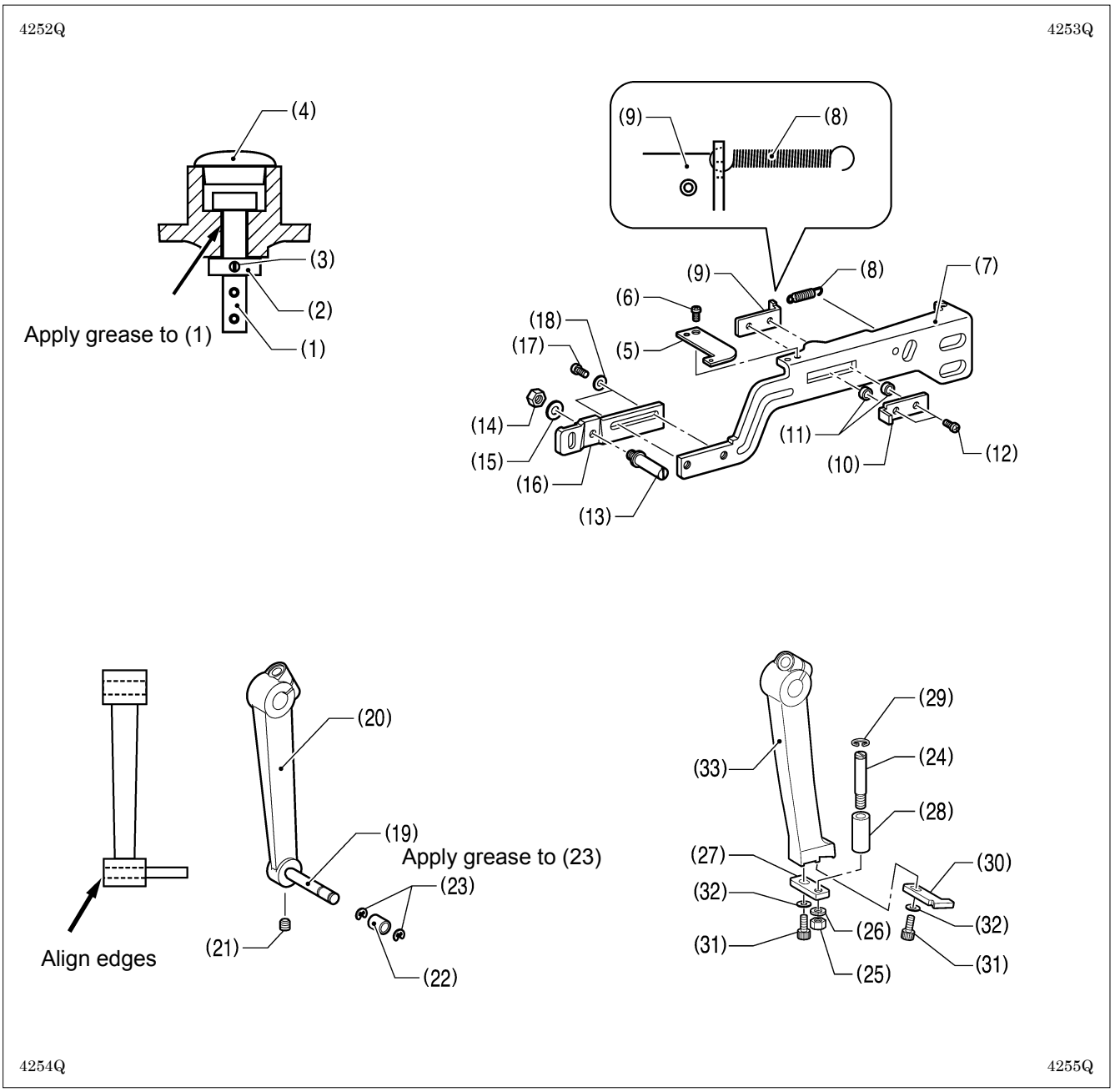
1. Insert the needle bar (2) into the needle bar bracket assembly (1), and then pass it through the needle bar clamp (3) as shown in the illustration.
2. Set the projection of the needle bar clamp (3) into the groove in the needle bar guide (4), and then install to the needle bar bracket assembly (1) with the two bolts (5) so that the needle bar (2) moves smoothly.
3. Insert the slide block (6) of the needle bar bracket assembly (1) into the zigzag lever shaft (7).
4. Insert the slide block (8) of the needle bar clamp (3) into the thread take-up lever set (9).
5. Insert the needle bar bracket assembly (1) into the arm while inserting the slide block (6) and (8), and then install it.
6. Pass the wick (11) of the needle bar bracket support shaft (10) through the arm.
7. Insert the needle bar bracket support shaft (10) and then secure it by tightening the set screw (12) so that there is no play in the needle bar bracket assembly (1).
8. Insert the needle bar bracket guide (13) into the arm, and then secure it by tightening the set screw (14) so that there is no play in the needle bar bracket assembly (1).
9. Install the set screw (15) and nut (16) to the stopper (15), and then install it to the arm with the two screws (18).
10. Install the set screw (19) and nut (20) to the arm.
11. When the needle bar (2) is at its maximum zigzag position, tighten the set screws (16) and (19) against the needle bar bracket assembly (1), and then loosen them again by about 1/4 of a turn each. Then tighten the nuts (17) and (20).
12. Insert the needle bar thread guide (21) into the needle bar (2).

3-19. Presser bar mechanism

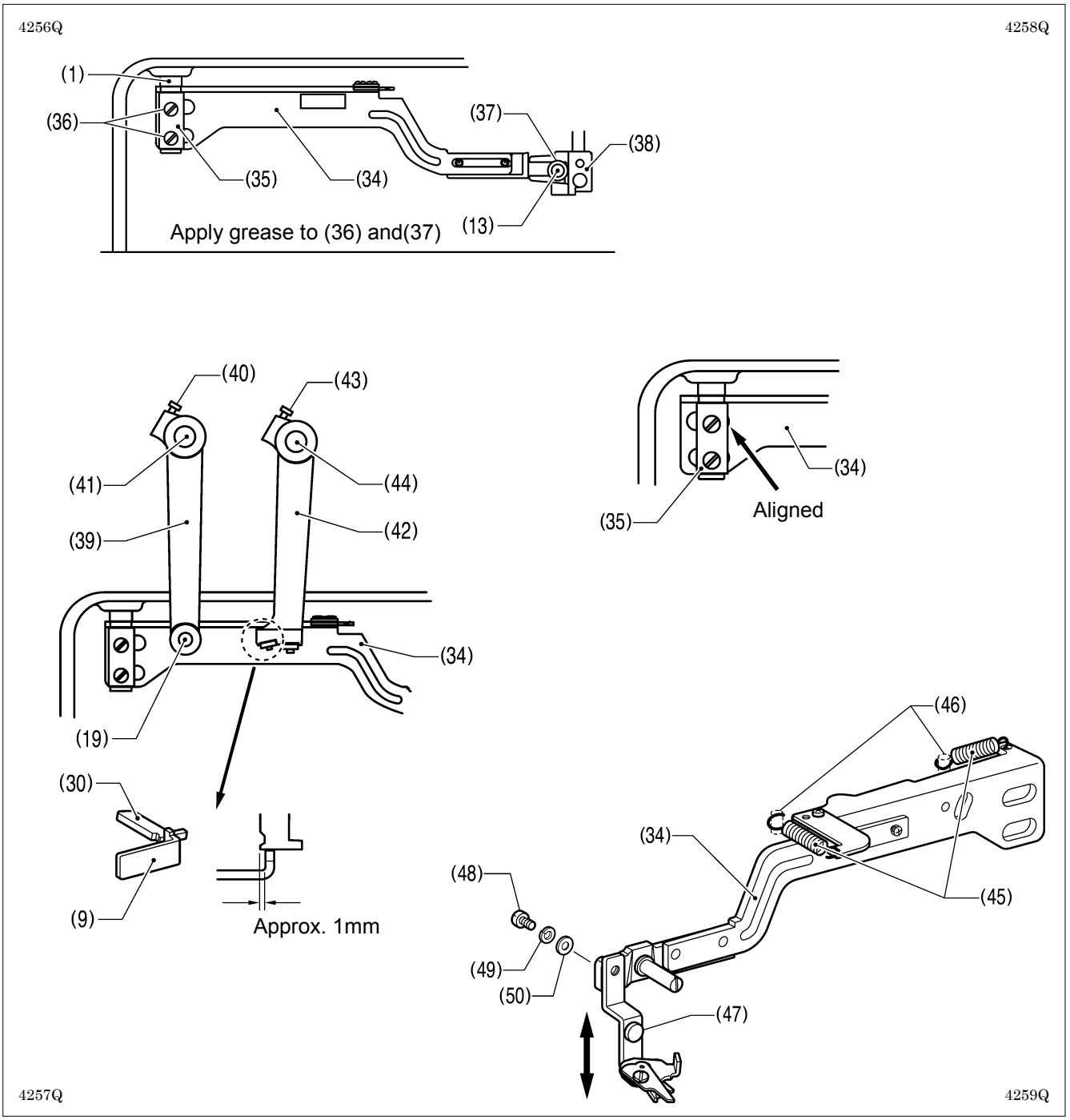


1. Install the presser bar lifter link (1) to the presser bar guide bracket (3) with the shoulder screw (2), and then install the set screw (4) to the presser bar guide bracket (3). (Presser bar guide bracket assembly (5))
2. Install the roller (6) to the roller shaft (9) with the plain washer (7) and the retaining ring (8).
3. Install the roller shaft (9) to the presser roller bracket (10), and then tighten the set screw (11).
4. Provisionally install the needle bar guide (12) to the arm with the two screws (13) as shown in the illustration.
5. Insert the presser bar (14) into the arm, and then pass it through the oil rejector (15) and the presser bar guide bracket assembly (5).
6. Position the needle bar guide (12) so that the presser bar (14) moves smoothly, and then tighten the two screws (13).
7. Tap in the rubber cap (16).
8. Install the presser roller bracket (10) to the presser bar (14) with the screw (17).
9. Connect the presser bar guide bracket assembly (5) and the knee lifter lever (18) with the shoulder screw (19).
10. Place a 10 mm gauge (21) underneath the work clamp (20).
11. Turn on the power, and after the mechanism moves to the home position, check that the setting for memory switch No.05 (work clamp height at neutral position) is 10 mm. (If it is not set to 10 mm, set it to 10 mm.)
12. While pushing the presser bar (14) down from above, tighten the set screw (4) so that the roller (6) is not at an angle to the V-shaped groove in the presser arm (22).
13. Remove the gauge (21) and turn off the power.
14. Insert the spring guide (23), compression spring (24) and plain washer (25), and with the presser adjusting screw (26) at a height of 30 mm, tighten the presser adjusting nut (27).

3-20. Upper thread trimmer mechanism

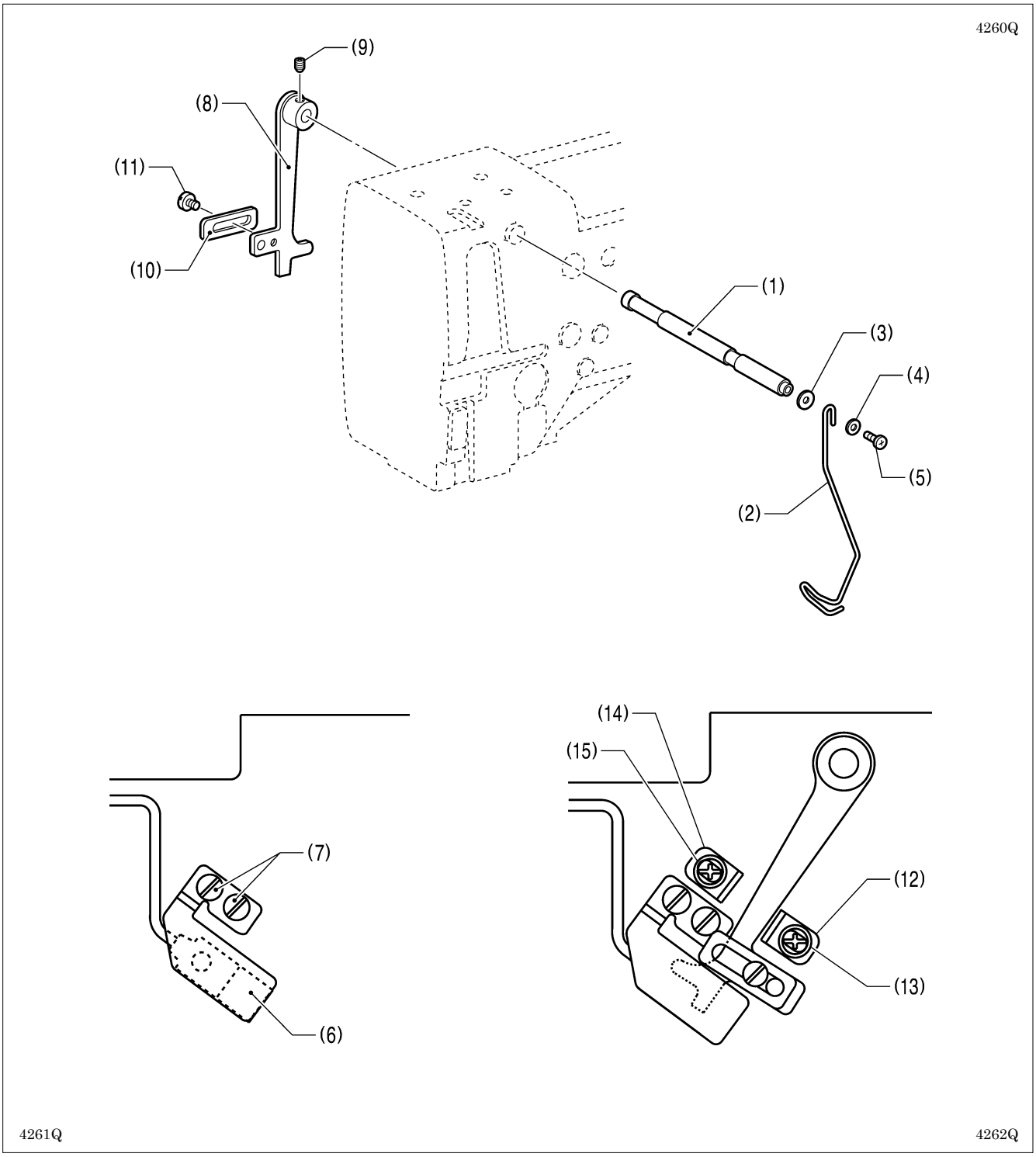


1. Insert the upper thread trimmer fulcrum shaft (1) into the arm, and then tighten the two set screws (3) of the set screw collar assembly (2) so that the upper thread trimmer fulcrum shaft (1) turns smoothly.
2. Install the rubber cap (4) from the top of the arm.
3. Install the spring hook plate (5) to the upper thread trimmer lever assembly (7) with the screw (6).
4. Attach the spring (8) to the stop plate (9) as shown in the illustration.
5. Install the back plate (10) and the stop plate (9) to the upper thread trimmer lever assembly (7) with the two collars (11) and the two screws (12). Apply grease to the sliding surfaces.
6. Install the support stud (13) to the setting plate (16) with the nut (14) and the plain washer (15).
7. Install the setting plate (16) to the upper thread trimmer lever assembly (7) with the two screws (17) and plain washers (18).
8. Press-fit the longitudinal feed arm pin (19) onto the longitudinal feed arm (20), and then secure it by tightening the set screw (21).
9. Place the longitudinal feed arm roller (22) onto the longitudinal feed arm pin (19), and secure it with the two retaining rings (23).
10. Install the roller shaft (24) to the support plate (27) with the nut (25) and the spring washer (26).
11. Place the driving arm roller (28) onto the roller shaft (24), and secure it with the retaining ring (29).
12. Install the support plate (27) and the stopper (30) to the trimmer driving arm (33) with the two bolts (31) and plain washers (32).



13.Install the upper thread trimmer lever set (34) to the upper thread trimmer fulcrum shaft (1) with the washer (35) and the two shoulder screws (36).
14.Place the roller (37) onto the support stud (13), and then place it into the groove in the presser roller bracket (38).
15.Pass the longitudinal feed arm pin (19) through the upper thread trimmer lever set (34), and provisionally install the longitudinal feed arm assembly (39) to the trimmer driving lever (41) with the bolt (40).
16.Provisionally install the trimmer driving arm assembly (42) to the trimmer driving lever (44) with the bolt (43).
17.Turn on the power, and after the mechanism moves to the home position, press the RESET key to lower the work clamp.
18.Tighten the bolt (40) so that the slot of the upper thread trimmer lever set (34) and the edge of the washer (35) are aligned.
19.Tighten the bolt (43) so that the stop plate (9) and the stopper (30) are in the positions shown in the illustration.
20.Attach the larger hooks of the two springs (45) to the pins (46) on the arm, and the smaller hooks to the upper thread trimmer lever set (34).
21.Install the upper thread trimmer assembly (47) to the upper thread trimmer lever set (34) with the screw (48), spring washer (49) and plain washer (50).

3-21. Thread breakage detection mechanism



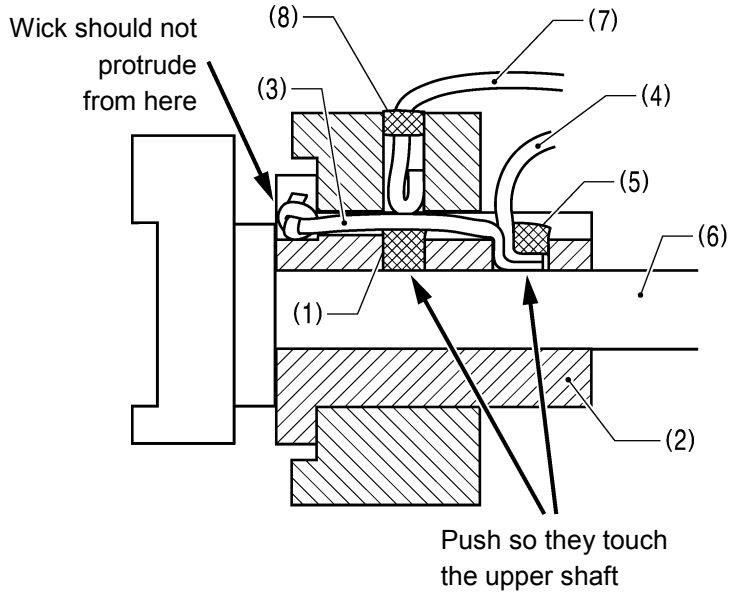
1. Provisionally install the thread guide (2) to the thread breakage perceiving shaft (1) with the plain washers (3) and (4) and the screw (5), and then insert the thread breakage perceiving shaft (1) into the arm.
2. Provisionally install the thread breakage sensor assembly (6) with the two screws (7).
3. Install the cutter bar fixing plate (8) to the thread breakage perceiving shaft (1) with the set screw (9).
4. Install the balancer (10) to the cutter bar fixing plate (8) with the screw (11).
5. Install the lever stopper (12) at the correct angle with the screw (13).
6. Provisionally install the lever stopper (14) with the screw (15).

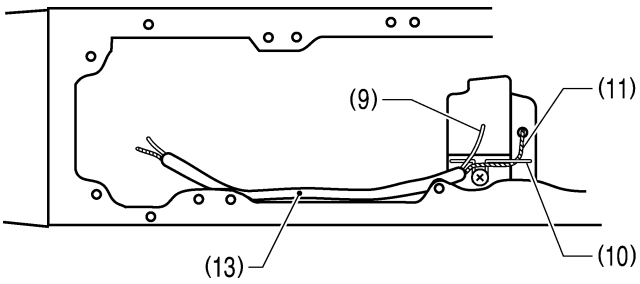
* After installing, carry out the steps in “4-17. Adjusting the thread breakage detector”.

3-22. Lubrication mechanism (2)

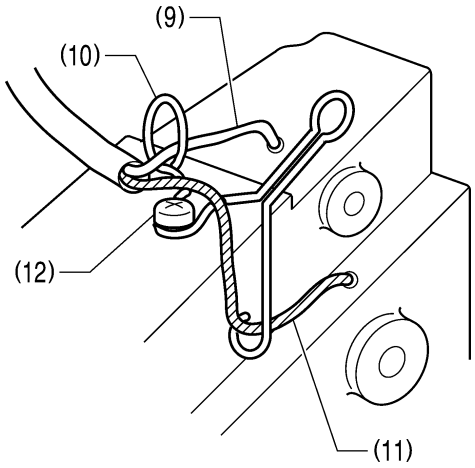
3-22-1. Shaft bush mechanism

4263Q





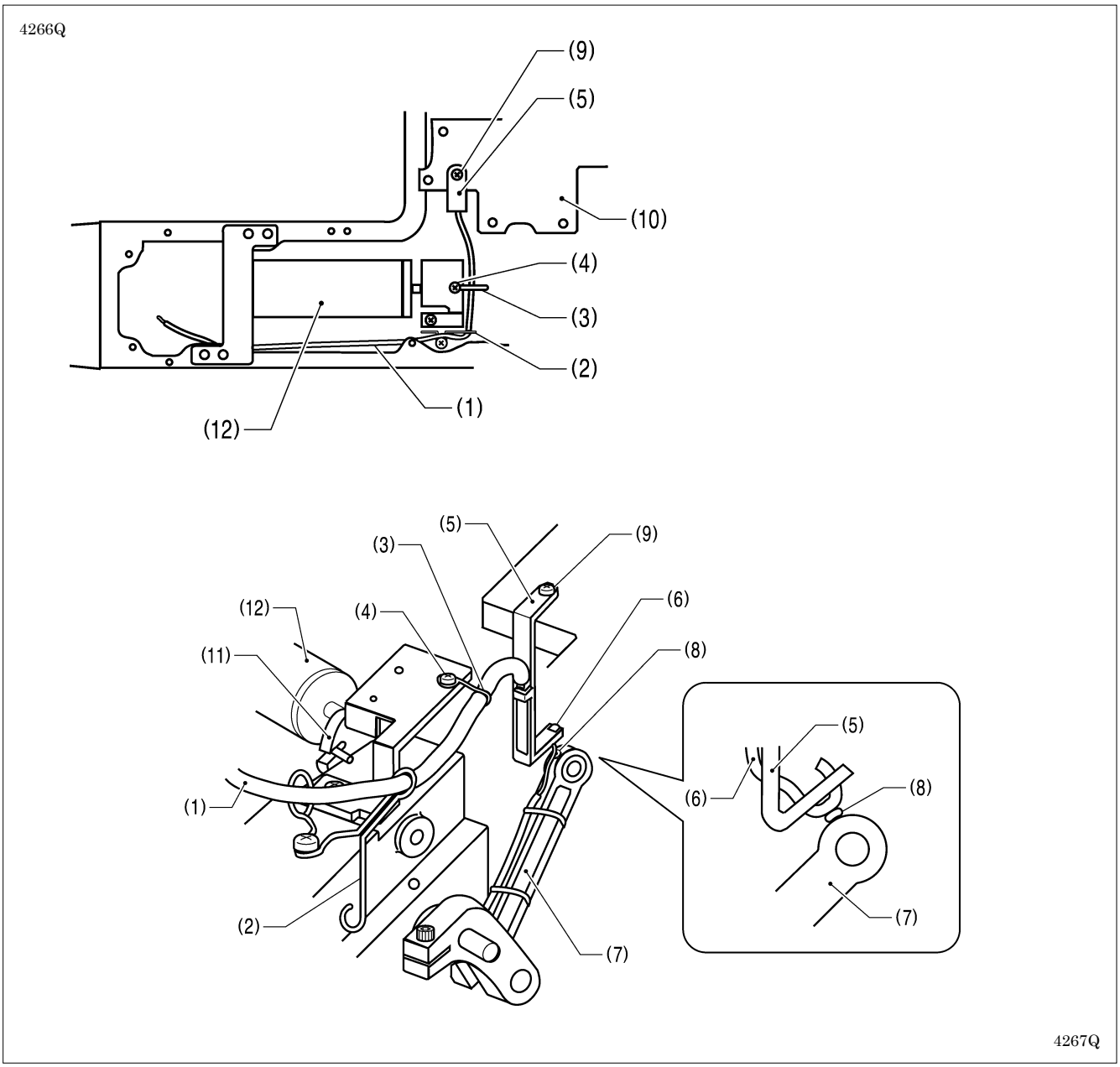
4264Q



4265Q

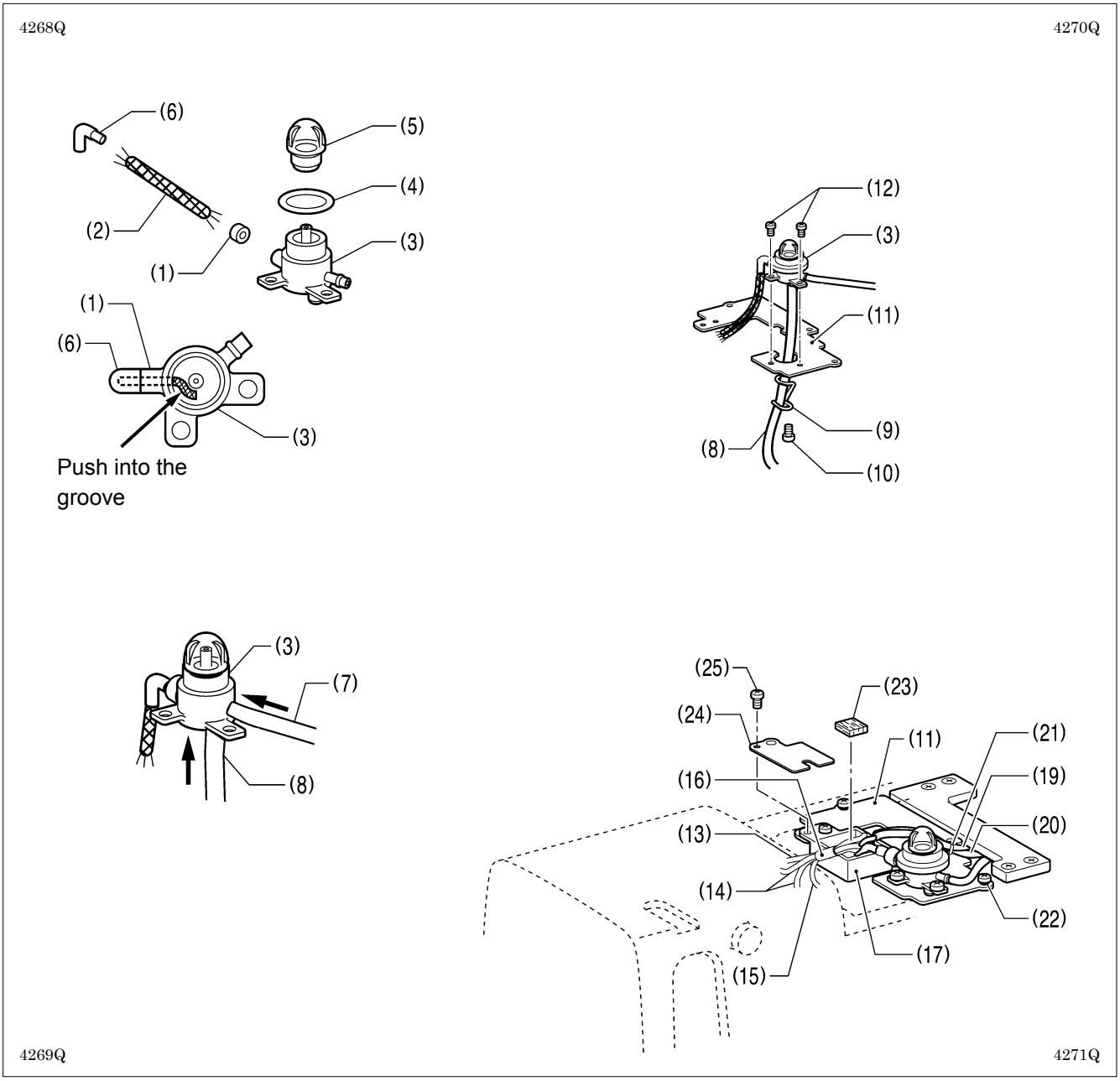
1. Insert the felt (1) into the bush F (2).
2. Insert the wicks (3) and (4) into the bush F (2), and insert the felt (5) to stop them from coming out.
   * At this time, push in firmly so that the felt (1) and the wick (3) are touching the upper shaft (6). If they are not pushed in firmly enough, seizure of the upper shaft may occur.
3. Insert the wick (7) into the bush F (2), and insert the felt (8) to stop them from coming out.
4. Pass the wick (9) through the tube support U (10) and push it firmly into the upper shaft lubrication hole.
5. Pass the wick (11) through the tube support U (10) and push it firmly into the zigzag lever shaft lubrication hole.
6. Install the tube support U (10) with the screw (12).
7. Pass the oil tube (13) around the outside of the tube support U (10) as shown in the illustration.

3-22-2. Needle zigzag mechanism



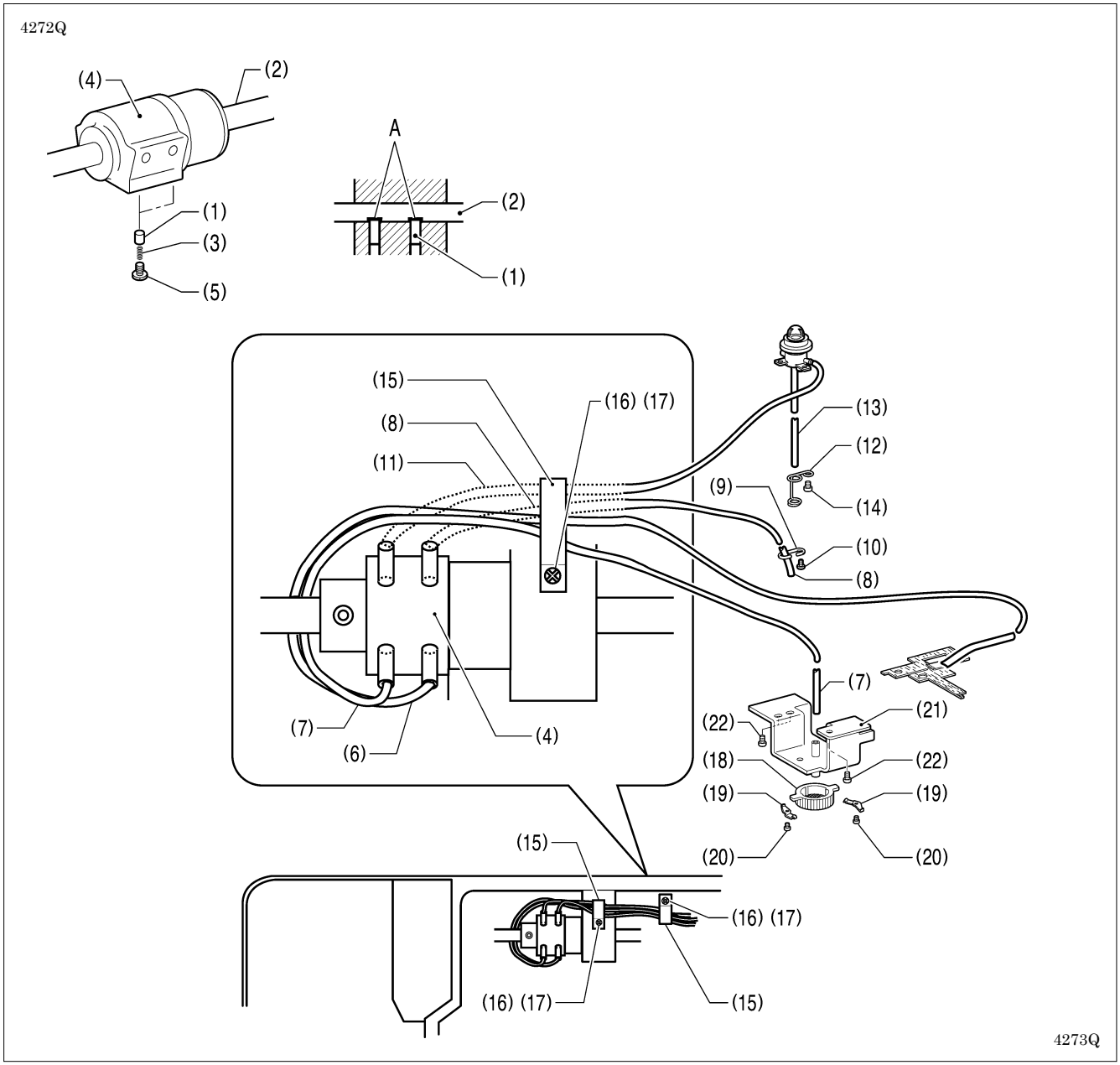
1. Pass the oil tube (1) through the tube support U (2) and the tube support (3), and then secure the tube support (3) with the screw (4).
2. Install the felt support assembly (5) to the motor bracket (10) with the screw (9) so that the felt (6) of the felt support assembly (5) is gently touching the felt (8) of the zigzag connecting rod (7).
3. Pass the oil tube (1) around the outside of the tube support U (2) as shown in the illustration so that it does not touch the solenoid stopper (11), and then pass it in between the cutter solenoid (12) and the arm.

3-22-3. Oil terminal mechanism



1. Pass the wick (2) through the collar (1), and then insert it into the oil terminal (3). Push the wick (2) firmly enough into the groove as shown in the illustration.
2. Insert the packing (4) into the oil terminal (3), and then install the oil cap (5).
3. Pass the wick (2) through the oil pipe B (6), and then install it to the oil terminal (3).
4. Push the oil tube (7) that is connected between the oil terminal and the plunger pump into the oil terminal (3).
5. Push the oil tube (8) that is connected between the oil terminal and the oil outlet into the oil terminal (3).
6. Install the tube support (9) to the wick base support (11) with the screw (10).
7. Attach the oil tube (8) to the tube support (9), and then install the oil terminal (3) to the wick base support (11) with the two screws (12).
8. Pass the wick (13) from the needle bar bracket, the two wicks (14) from the bush and the wick (15) from the support shaft through the oil tube (16), and then install the felt base A (17) to the wick base support (11) with the screw (18).
9. Install the oil tube (19) for lubricating the bush M and the zigzag lever shaft and the oil tube (20) for lubricating the zigzag mechanism to the wick base support (11) with the fastening band (21).
10. Install the wick base support (11) with the two screws (22).
11. Insert the felt (23), and then install the cap (24) with the screw (25).

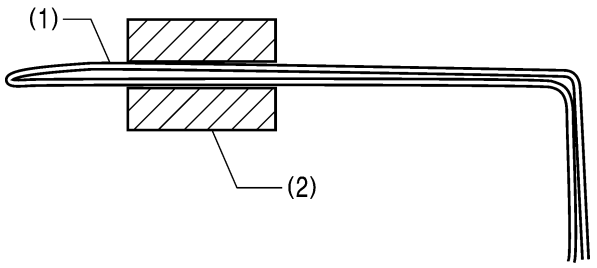
3-22-4. Plunger pump mechanism



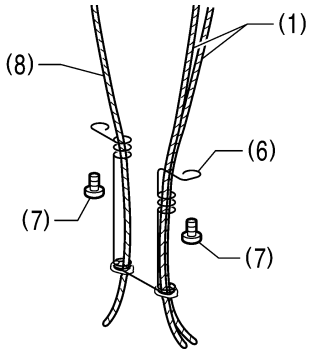
1. Check that the notches A of the plungers (1) and the lower shaft (2) are aligned, and then insert the two plungers (1) and the compression springs (3) into the bush M (4) and secure them with the two screws (5).
2. Insert the oil tube (6) into the lubricating hole to the right of the bush M (4).
3. Insert the oil tube (7) that is connected between the plunger and the filter into the lubricating hole to the left of the bush M (4).
4. Insert the oil tube (8) into the lubricating hole to the right of the bush M (4).
5. Pass the outlet of the oil tube (8) through the tube support (9), and then install the tube support (9) to the bed with the screw (10).
6. Insert the oil tube (11) that is connected between the oil terminal and the plunger pump through the lubricating hole to the left of the bush M (4).
7. Pass the oil tube (13) that is connected between the oil terminal and the oil outlet through the tube support D (12), and then install the tube support D (12) to the bed with the screw (14).
8. Secure the four tubes that are coming out from the bush M (4) to the bed in two places as shown in the illustration with the cord holders (15), screws (16) and plain washers (17).
9. Install the pump filter (18) to the oil filter bracket (21) with the two springs (19) and the two screws (20).
10. Insert the oil tube (7) that is connected between the plunger and the filter through the oil filter bracket (21).
11. Install the oil filter bracket (21) to the bed with the three screws (22).

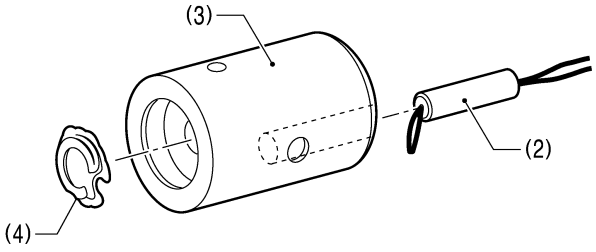
3-22-5. Rotary hook lubrication mechanism

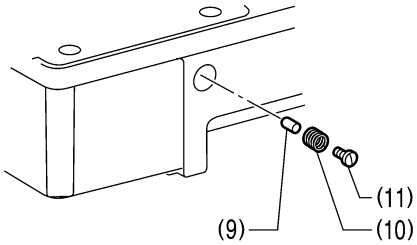
4274Q

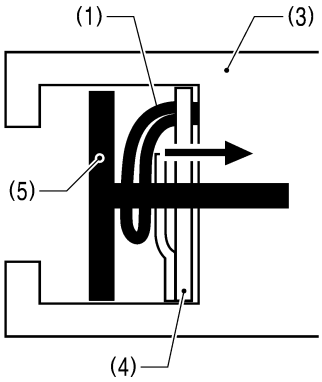


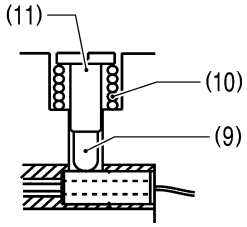
4276Q









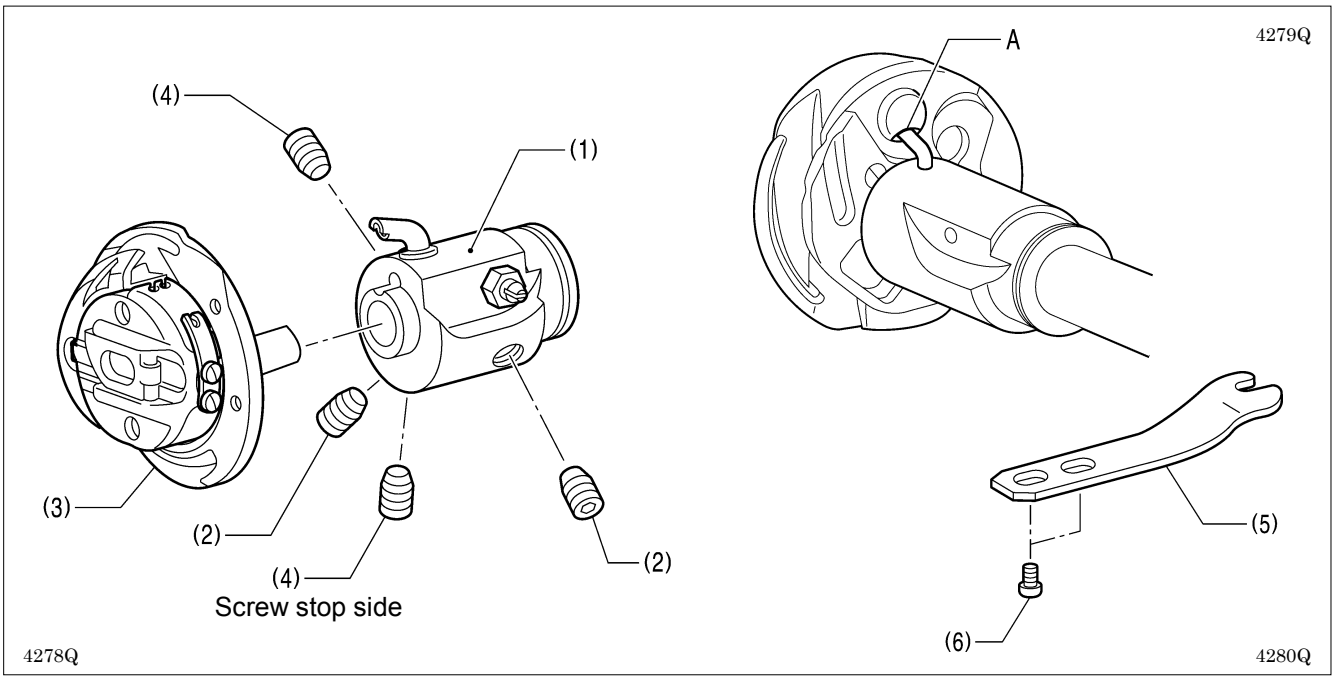


4275Q

4277Q

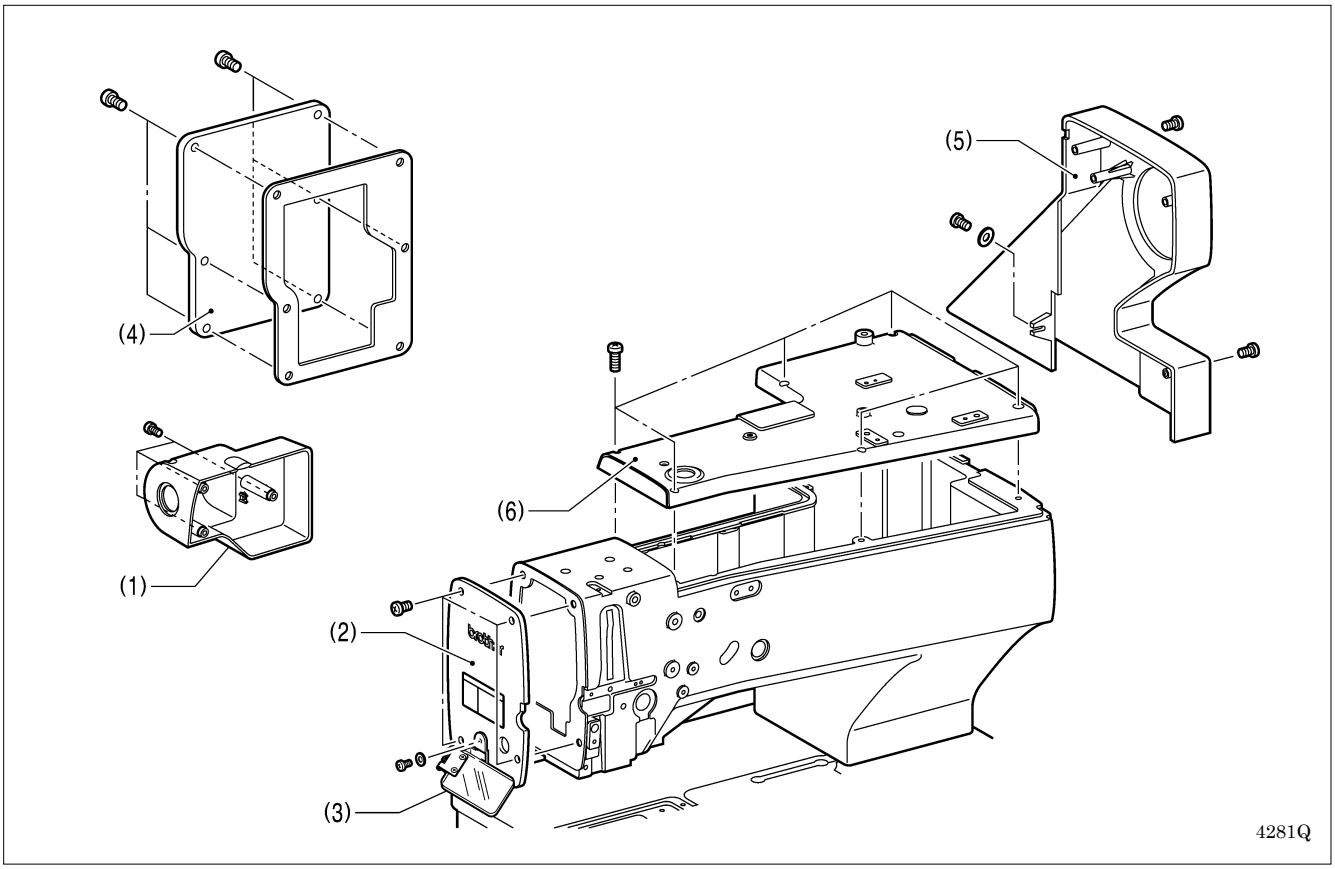
1. Pass the wick (1) through the collar (2) as shown in the illustration.
2. Place the collar (2) onto the bush (3) as far as the base of the hollow.
3. Insert the spring (4) into the bush (3), and then insert the wick (1) as shown in the illustration.
   * At this time, check that the spring (4) is not compressed when the wick (1) is pulled in the direction of the arrow.
4. Push the end of the felt (5) into the hole in the bush (3) and stop it from turning.
5. Install the felt support (6) to the bed with the two screws (7).
6. Pass the wick (1) through the felt support (6) and then tie a knot in it.
7. Pass the wick (8) through the felt support (6) and then tie a knot in it.
8. Insert the rubber presser (9) into the bed, and then secure it with the spring (10) and the screw (11).
   * As a guide for the lubrication amount, the optimum position can be obtained if the screw (11) is tightened as much as possible and then loosened about two turns. Refer to “4-23. Adjusting the rotary hook lubrication” to check and adjust the lubrication amount.

3-23. Rotary hook mechanism



1. Install the rotary hook joint assembly (1) to the lower shaft, and then tighten the two set screws (2).
2. Tighten the set screw (4) so that the oil inlets A in the rotary hook (3) and the rotary hook joint assembly (1) are aligned.
3. Adjust the needle clearance and timing. (Refer to “4-6. Adjusting the needle and rotary hook timing”.)
4. Install the rotary hook holder (5) with the two screws (6).

3-24. Covers



1. Install the cover (1), the face plate (2) and the eye guard assembly (3).
2. Install the rear cover (4), the belt cover (5) and the top cover (6).

4. ADJUSTMENT

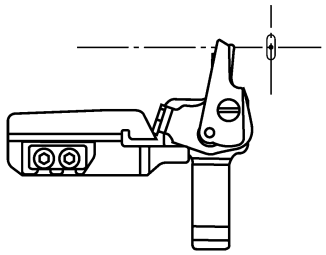
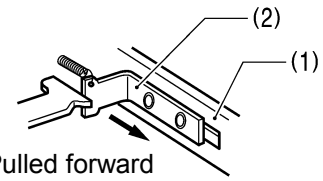
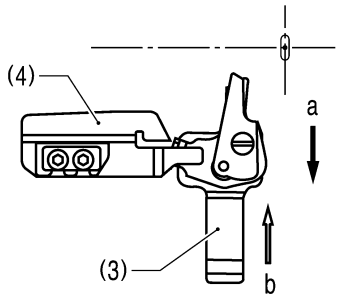
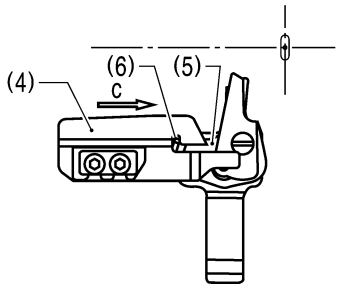
⚠ CAUTION

- Maintenance and inspection of the sewing machine should only be carried out by a qualified technician.
- Ask your Brother dealer or a qualified electrician to carry out any maintenance and inspection of the electrical system.
- Turn off the power switch and disconnect the power cord from the wall outlet at the following times, otherwise the machine may operate if the treadle is depressed by mistake, which could result in injury.
  - When carrying out inspection, adjustment and maintenance
  - When replacing consumable parts such as the rotary hook
- If the power switch needs to be left on when carrying out some adjustment, be extremely careful to observe all safety precautions.
- Use only the proper replacement parts as specified by Brother.
- If any safety devices have been removed, be absolutely sure to re-install them to their original positions and check that they operate correctly before using the machine.
- Any problems in machine operation which result from unauthorized modifications to the machine will not be covered by the warranty.

4-1. Notes on making adjustments

[When turning on the power to make adjustments]
Turn on the power and set the sewing machine to the home position. Then press the RESET key to lower the work clamp before carrying out adjustments.
"¯AdJ" will appear in the parameter display LED and the machine will not operate even if the treadle is depressed.
* Some items are adjusted without the RESET key being pressed. Carry out the adjustment by following the explanations given.

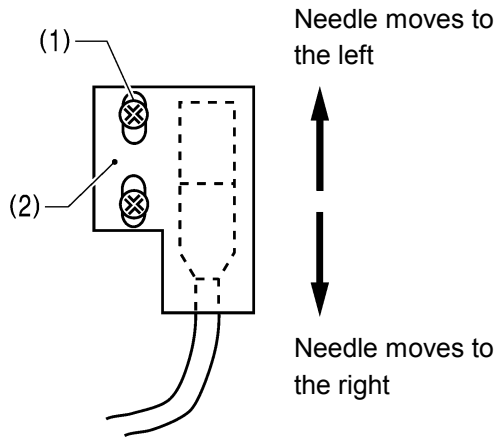
[When turning off the power to make adjustments]
Do not force any of the parts to move, as doing so may result in damage to the parts.
- Be sure to turn the machine pulley to raise the needle bar to its highest position before making adjustments.
  If this is not done, the pulley position (the direction of rotation of the rotary hook) may cause the lower thread trimmer mechanism to touch the rotary hook when the lower thread trimmer mechanism operates.
- When turning the machine pulley, do it at a position where the thread trimmer mechanism will not operate (the position where the presser foot lifter pulse motor is at the home position).
  If the machine pulley is turned at a position where the thread trimmer mechanism operates, the needle may touch the lower thread trimmer mechanism (lower thread retainer and lower thread trimmer knife).
  If the machine pulley is turned at a position where the thread trimmer mechanism operates, the rotary hook and the lower thread trimmer mechanism may touch.
- When moving the feed mechanism, do it at a position where the thread trimmer mechanism will not operate (the position where the presser foot lifter pulse motor is at the home position).
  If this is not done, the lower thread retainer and the feed guide shaft may alternately push against the lower thread clamp and the opening plate, and damage may result.
- When pushing the knife down by hand, be careful not to let it touch the upper thread scissors.
- Do not move the feed mechanism while the stop plate of the upper thread trimmer lever is pulled forward and the upper thread scissors are open (the upper thread trimmer lever is pushed to the left).
  Always return the stop plate to its original position before moving the feed mechanism or returning it to the home position.

Fig. A		Presser foot lifter pulse motor and feed pulse motor home position (sewing start position)
Fig. B	 	When the stop plate (2) of the upper thread trimmer lever (1) is pulled forward from the position in figure A, the upper thread trimmer assembly (3) moves in the direction of the arrow a and goes below the projection of the opening cam (4).
Fig. C		Then when the feed mechanism is operated (arrow c), the upper thread trimmer assembly (3) is forced to go behind the opening cam (4). Depending on the case, the rising section (6) of scissors M (5) goes into the hollow shown in the figure and the feed mechanism cannot then operate. At this time, when feed mechanism home positioning is carried out, the feed pulse motor goes out of step. * Operate the feed mechanism when the condition is as shown in figure A. * If it is pushed in the direction of arrow b at the condition shown in figure B, the condition will change to that shown in figure A.

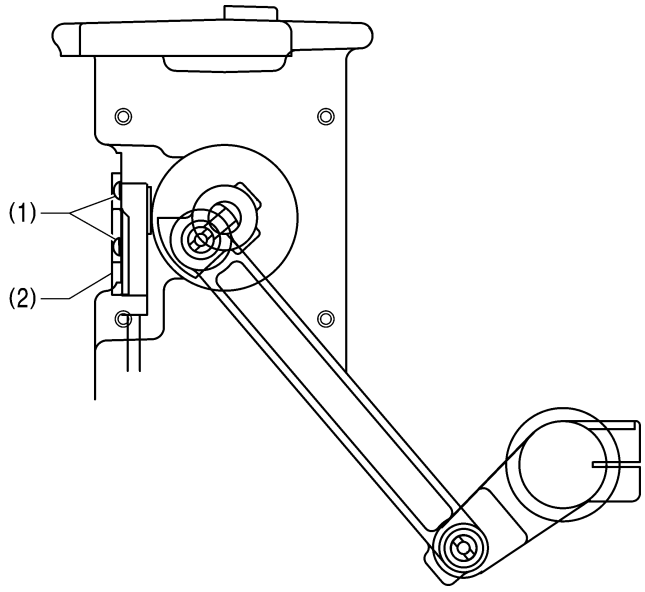
4282Q

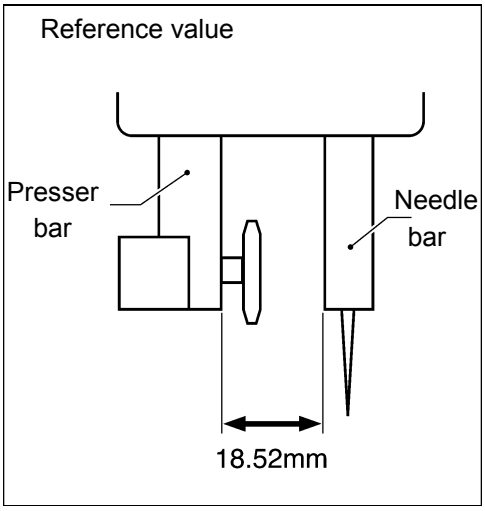
4-2. Adjusting the needle zigzag home position sensor position

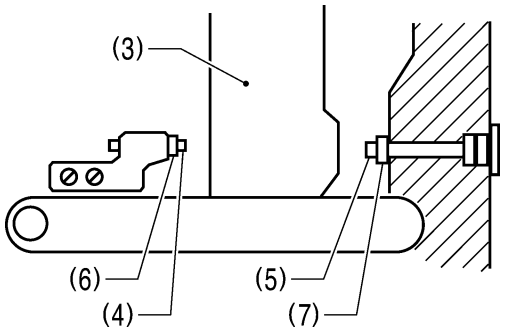
4283Q



4284Q





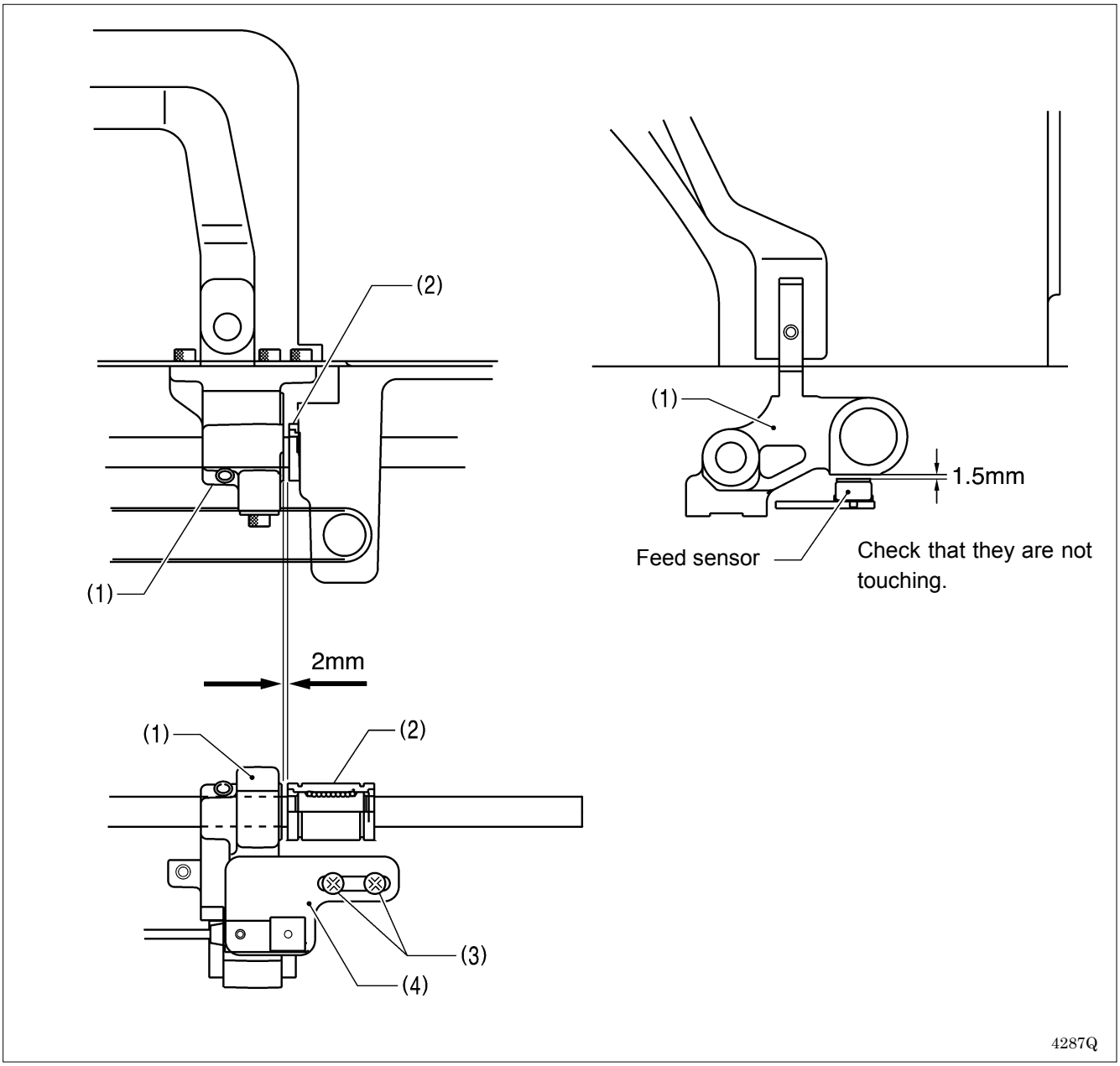


4285Q

4286Q

1. Turn on the power and set the sewing machine to the home position. Then press the RESET key to lower the work clamp.
2. If the needle is in the center of the needle plate hole, the following adjustment is not necessary. If the needle is not in the center of the needle plate hole, turn off the power.
3. Loosen the two screws (1), and then adjust the vertical position of the zigzag sensor plate (2).
   * The adjustment required is only slight, so move the zigzag sensor plate (2) a little bit at a time.
4. Repeat the procedure from step 1.
5. After adjusting, check that the needle bar bracket (3) and the stopper screws (4) and (5) are not touching when in test feed mode. If they are touching, adjust the stopper screws (4) and (5).
   If the needle bar is at its furthest zigzag position, place the stopper screws (4) and (5) against the needle bar bracket (3), and then turn them back about 1/4 of a turn. Then tighten the nuts (6) and (7).

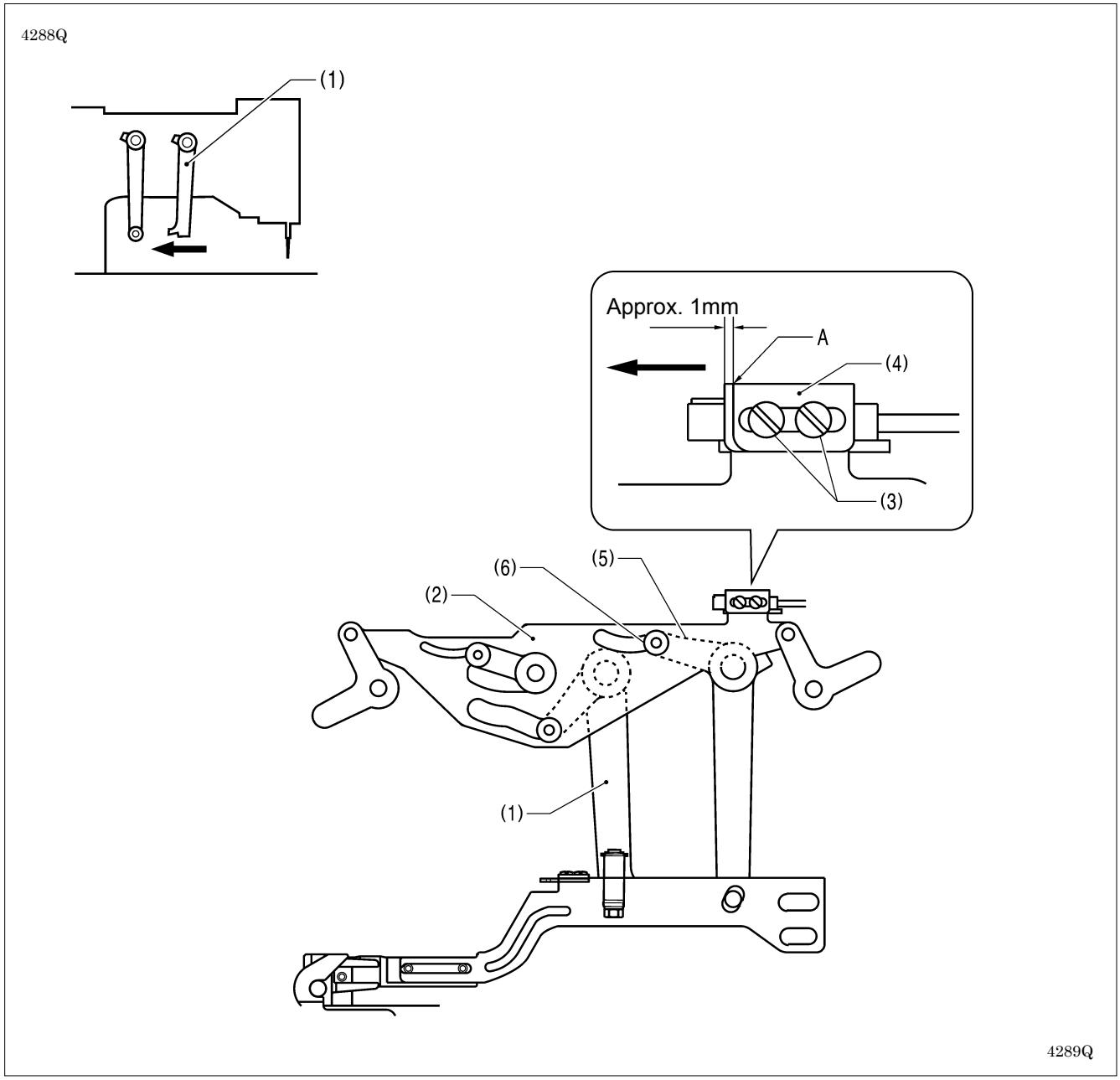
4-3. Adjusting the feed home position sensor position



1. Turn on the power and set the sewing machine to the home position. Then press the RESET key to lower the work clamp.
2. If the clearance between the feed arm support (1) and the linear bushing (2) is 2 mm, the following adjustment is not necessary. If the clearance is not 2 mm, turn off the power.
3. Loosen the screw (3) and adjust the position of the feed sensor support plate (4).
4. Repeat the procedure from step 1.

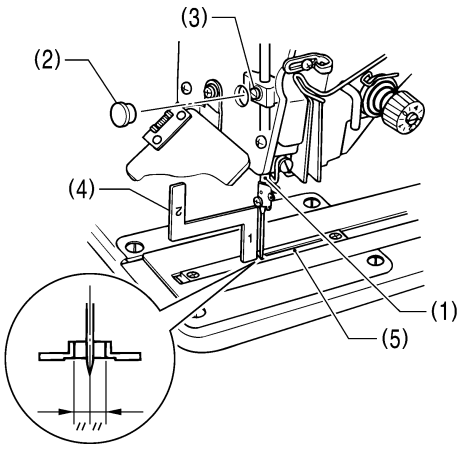
4-4. Adjusting the work clamp home position sensor position

Be sure to make this adjustment before carrying out "4-14. Adjusting the upper thread trimming".

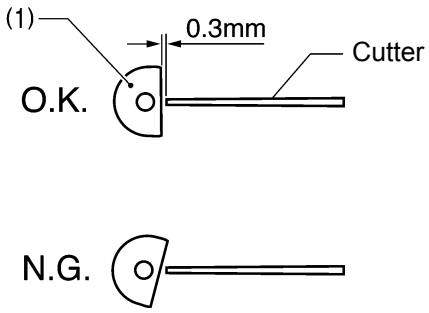


1. Turn on the power.
   * Do not set the sewing machine to the home position.
2. Move the trimmer driving arm (1) in the direction of the arrow to move the upper thread trimmer driving link (2) until it is stopped by the face plate.
3. Loosen the two screws (3), and then move the dog (4) by approximately 1 mm in the direction of the arrow past position A where the work clamp sensor turns on (the work clamp sensor LED lights).
   * This is the provisional position for the work clamp home position sensor. The final position is determined when making the adjustment in "4-14-8. Adjusting the upper thread scissors opening timing".
4. Set the sewing machine to the home position, and then press the RESET key. Check that there is no impact noise and that the motor does not go out of step when the work clamp is lowered and raised.
   * If the adjustment is not correct, the work clamp may touch the upper thread trimmer driving link (2) and the roller (6) of the driving lever (5), and this may cause the motor to go out of step.
5. After making this adjustment, carry out “4-18. Adjusting the thread tension at the tack tension control” and "4-14. Adjusting the upper thread trimming".

4-5. Adjusting the needle bar height



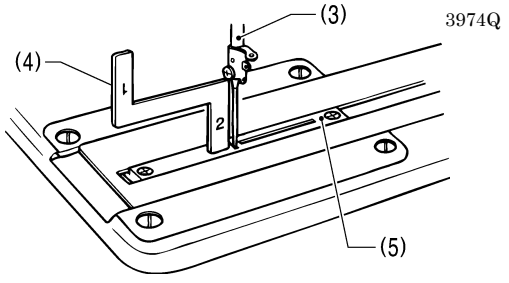
3972Q



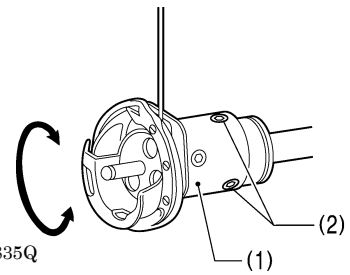
4290Q

1. Turn on the power and set the sewing machine to the home position. Then press the RESET key to lower the work clamp.
2. Set the needle bar (1) to its lowest position.
   * Check that the needle is in the center of the needle hole. If adjustment is necessary, make the adjustment while referring to "4-2. Adjusting the needle zigzag home position sensor position".
3. Remove the rubber cap (2) from the face plate, and then loosen the set screw (3) of the needle bar clamp.
4. Insert the “1” part of the gauge (4) between the needle plate (5) and the lower edge of the needle bar (1), and touch the needle bar against the gauge.
   * Different gauges are used for each of the two specifications -2 and -3, so make sure that the gauge being used matches the specifications and application for the sewing machine being adjusted.
5. Tighten the set screw (3).
6. Install the rubber cap (2).
7. Check that the cutter flank of the needle bar (1) is at a right angle to the cutter.
   Note: If the installation positions are not correct, the needle bar (1) and the cutter may touch when the needle zigzags, which may result in noise or cause the needle to break.

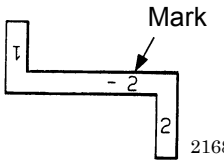
4-6. Adjusting the needle and hook timing



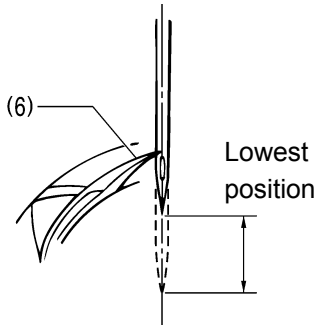
3974Q



2835Q



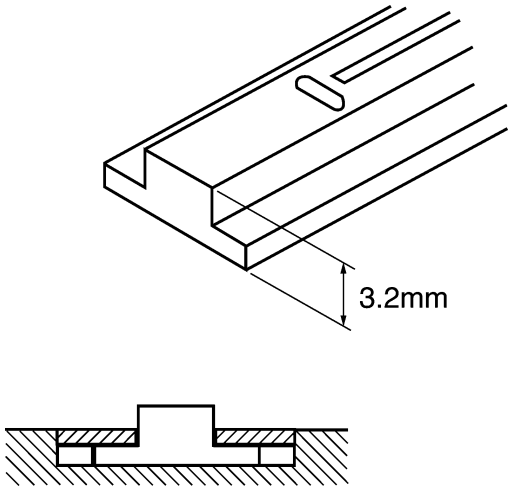
2168Q



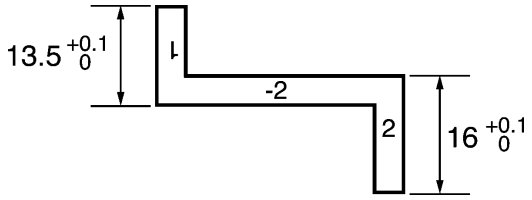
2837Q

1. Turn on the power and set the sewing machine to the home position. Then press the RESET key to lower the work clamp.
2. Loosen the two screws (2) of the rotary hook joint (1).
3. Turn the pulley in the regular direction of rotation (toward the front) so that the needle bar (3) just begins to rise from its lowest position.
4. Insert the “2” part of the gauge (4) between the needle plate (5) and the lower edge of the needle bar (3), and then align the rotary hook point (6) with the center of the needle when the needle bar contacts the gauge.

* Different gauges are used for each of the two specifications -2 and -3, so make sure that the gauge being used matches the specifications and application for the sewing machine being adjusted.

<table>
<tr><th>Needle plate thickness</th><th>Application</th><th>Gauge</th></tr>
<tr><td rowspan="2"> 

4292Q</td><td>Clothing
(-2)

Knitted
wear</td><td>S13595-001 Gauge 815-2
 

4294Q</td></tr>
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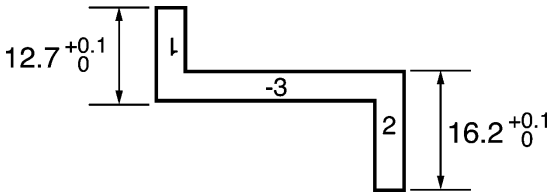
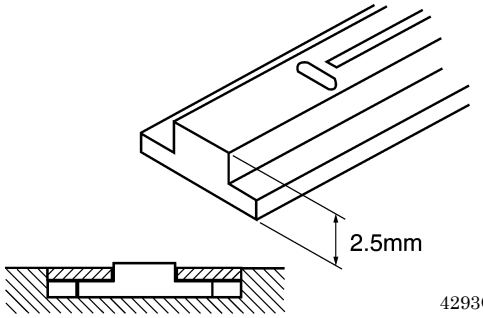
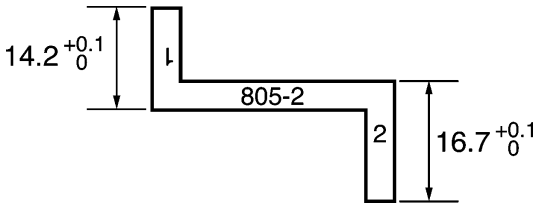
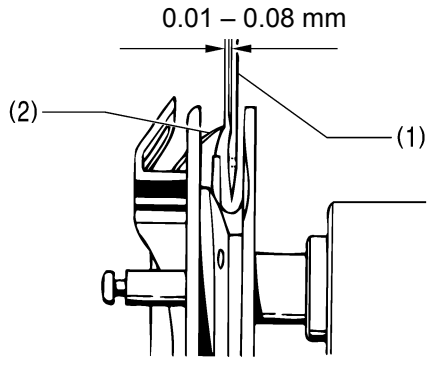
wear
(-3)</td><td>S13596-001 Gauge 815-3
 

4295Q</td></tr>
<tr><td> 

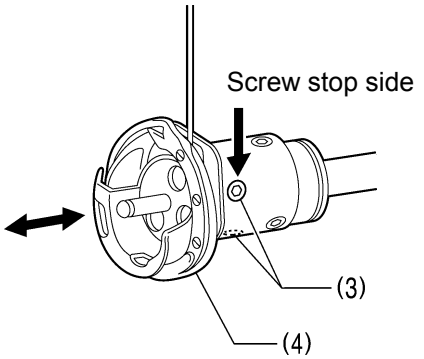
4293Q</td><td>Thin knitted
wear</td><td>S13597-001 Gauge 805-2
 

4296Q</td></tr>
</table>

4-6-1. Adjusting the clearance between needle and hook point



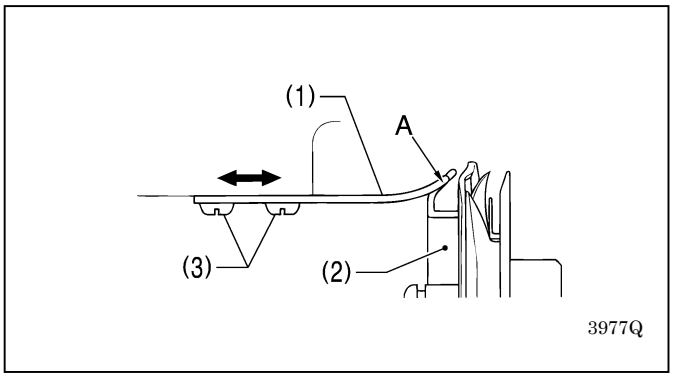
2839Q



2840Q

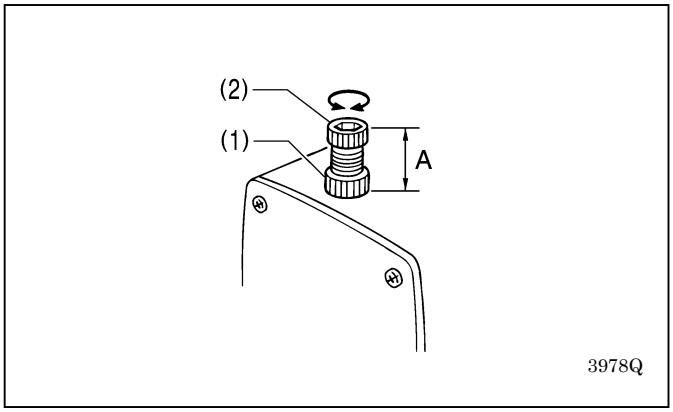
Loosen the set screws (3) and move the rotary hook (4) forward or back until there is a clearance of 0.01 to 0.08 mm between the needle (1) and the hook point (2).
* When tightening the set screws (3), tighten the one on the screw stop side first.

4-7. Adjusting the inner rotary hook and rotary hook holder overlap



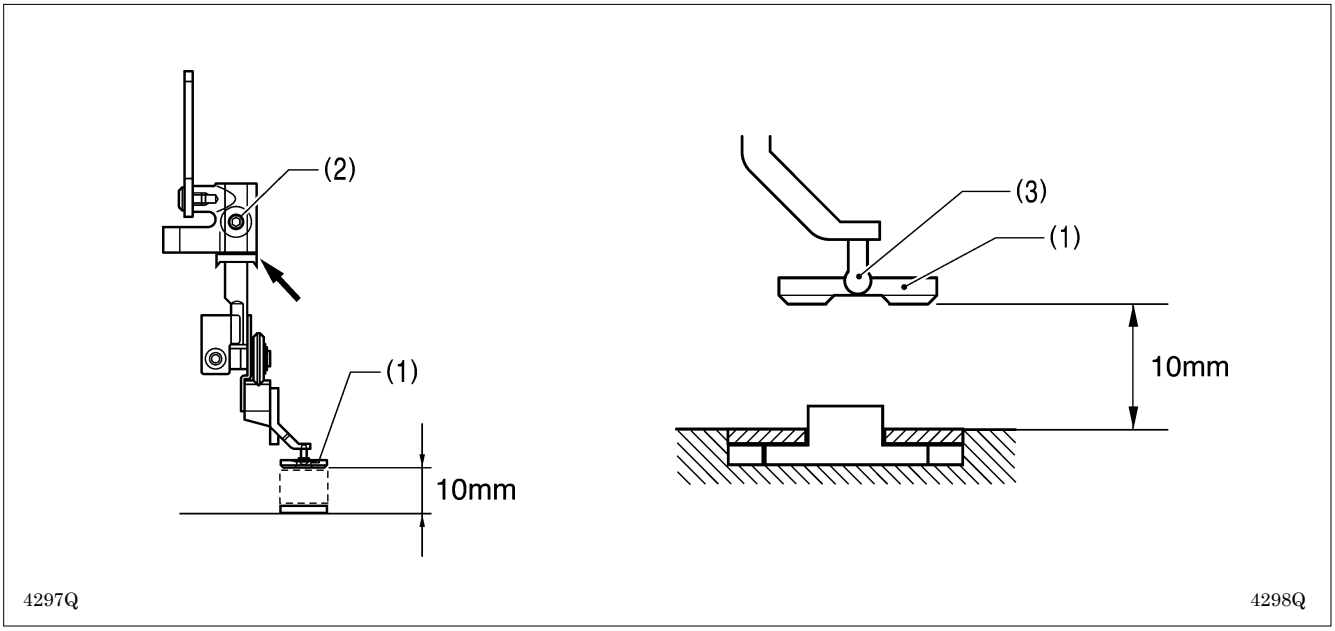
Loosen the two screws (3) to adjust so that the tip of the rotary hook holder (1) does not protrude past the edge A of the inner rotary hook (2).

4-8. Adjusting the work clamp pressure



The standard distance A is 30 mm (approximately 30 N).
Loosen the nut (1) and turn the adjusting screw (2) to adjust the work clamp pressure.
* When the adjusting screw (2) is tightened as far as it will go, the work clamp pressure will be about 70 N.

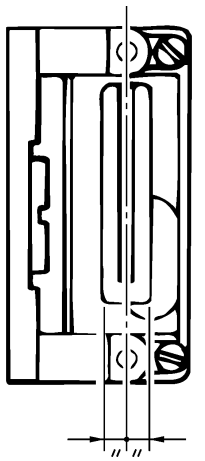
4-9. Adjusting the work clamp lift amount



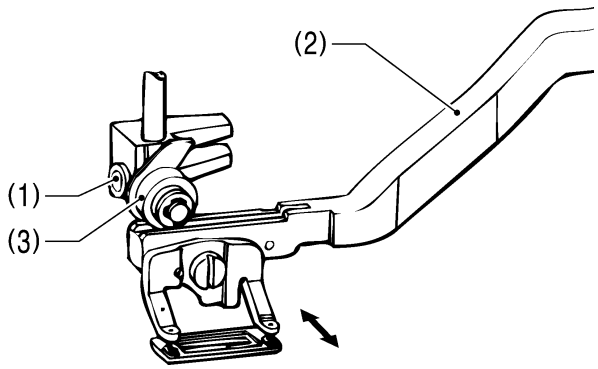
1. Turn on the power and set the sewing machine to the home position.
2. Check that memory switch No. 05 (work clamp height at neutral position) is set to 10 mm. (If it is not set to 10 mm, set it to 10 mm.)
3. Place a 10 mm gauge under the work clamp (1) and then loosen the set screw (2) to make the adjustment.

* Adjust the lift amount (including the play in the work clamp (1) and the pin (3) to 10 mm. If it is set to more than 10 mm, the work clamp will start lifting before lower thread trimming is complete, which may result in thread trimming errors. Furthermore, it may also cause the presser foot lifter pulse motor to go out of step.

4-10. Adjusting the work clamp lateral position



4299Q

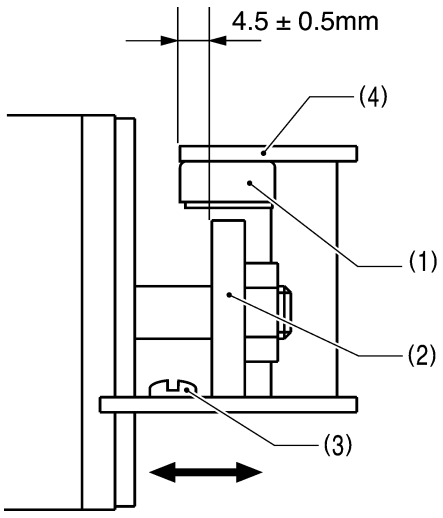


4300Q

1. Loosen the set screw (1), and then move the feed arm (2) and the roller (3) to adjust so that the knife groove comes to the center of the work clamp window.
2. Operate the treadle and check that the work clamp moves up and down smoothly.

* After adjusting, check the upper thread trimmer mechanism and adjust if necessary.

4-11. Adjusting the cutter home position sensor position



4301Q

Loosen the screw (3), and then adjust the cutter sensor setting plate (4) so that there is a clearance of 4.5 ± 0.5 mm between the side of the cutter sensor (1) and the edge of the solenoid stopper (2).

4-12. Adjusting the cutter installation position

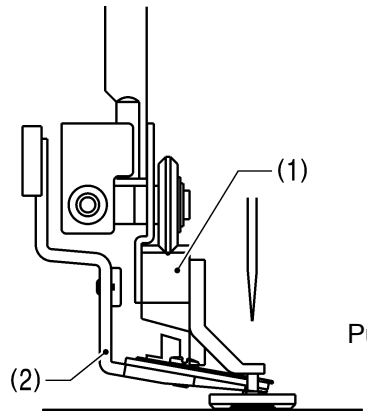


Fig. A

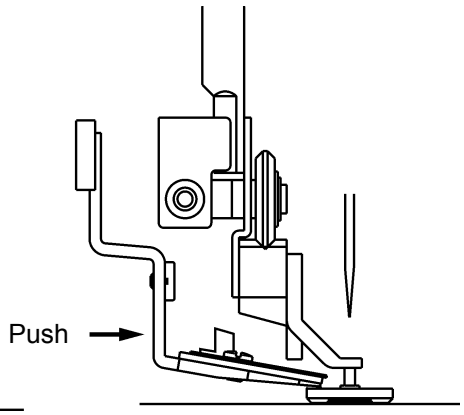
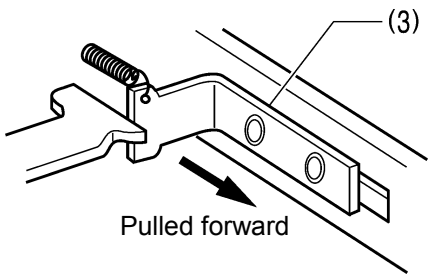


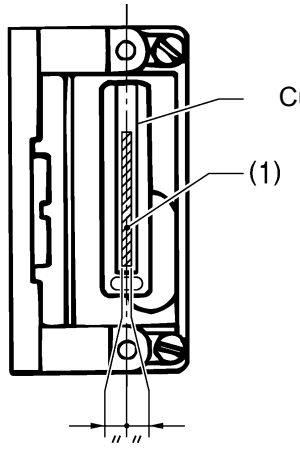
Fig. B

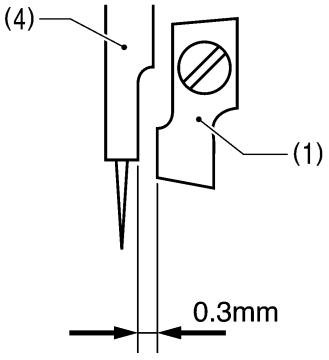


4302Q 4303Q

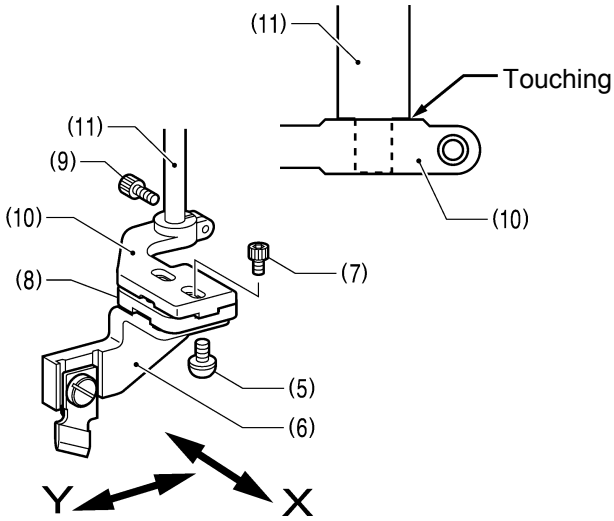
Adjust so that the upper thread scissors (2) and the cutter (1) do not touch when the cutter (1) is pushed down by hand.
If the upper thread scissors (2) extends below the cutter (1), pull the stop plate (3) forward and move the upper thread scissors (2) to the left. (Fig. A → Fig. B)

4304Q





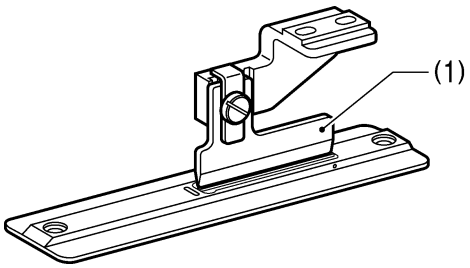
4305Q



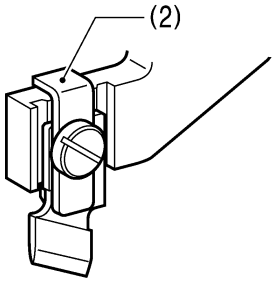
4306Q

1. Loosen the screw (5), and adjust the cutter Y direction using cutter holder DL (6) so that the clearance between the needle bar (4) and the cutter (1) is 0.3 mm.
   Note: When replacing the cutter, be careful not to allow the cutter to touch the needle bar because of any play in the cutter installation position.
2. Loosen the two bolts (7) and adjust the cutter X direction using cutter holder M (8) so that the cutter (1) goes into the center of the cutter groove.
3. Loosen the bolt (9) and move the cutter holder (10) to adjust the direction of rotation.
4. Check that the edge of the cutter holder (10) is touching the stepped section of the cutter driving shaft (11), and then tighten the bolt (9).
5. After adjusting, push the upper thread scissors (2) back to its original position (Fig. A).

4-12-1. When using the special needle plate (needle plate -RB)



4307Q

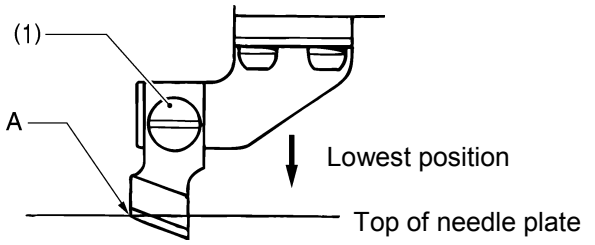


4308Q

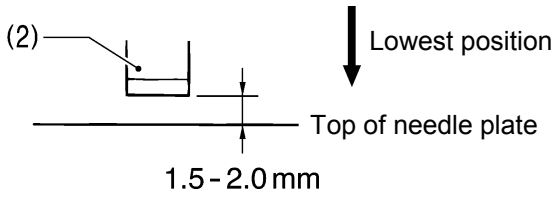
The special needle plate is used to prevent the cutter from getting stuck in the material and not returning.

1. The special needle plate has a narrow cutter groove of 0.3 - 0.4 mm, so use the accessory positioning plate (1) to adjust the cutter installation position.
   Note: If this adjustment is not made, the cutter may touch the needle plate, and damage to the cutter may result.
2. Install the cutter holder (2) to minimize any play in the cutter during cutting.

4-13. Adjusting the cutter installation height



4309Q



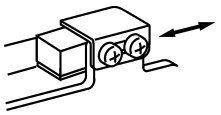
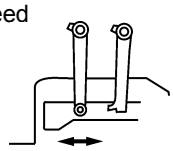
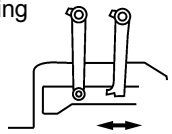
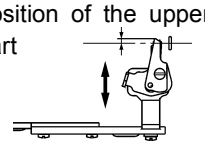
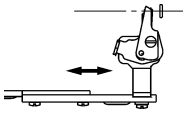
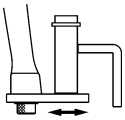
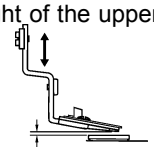
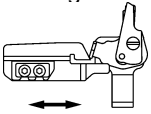
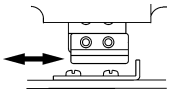
4310Q

Adjust so that the upper thread scissors and the cutter do not touch when the cutter is pushed down by hand. (Fig. A → Fig. B in “4-12. Adjusting the cutter installation position”)

Install the cutter with the screw (1) so that the tip A of the cutter blade is aligned with the top of the needle plate when the cutter is pressed down by hand to its lowest position.
If using the flat cutter (2), install with the screw (1) so that there is a clearance of 1.5 - 2.0 mm between the cutter and the top of the needle plate.

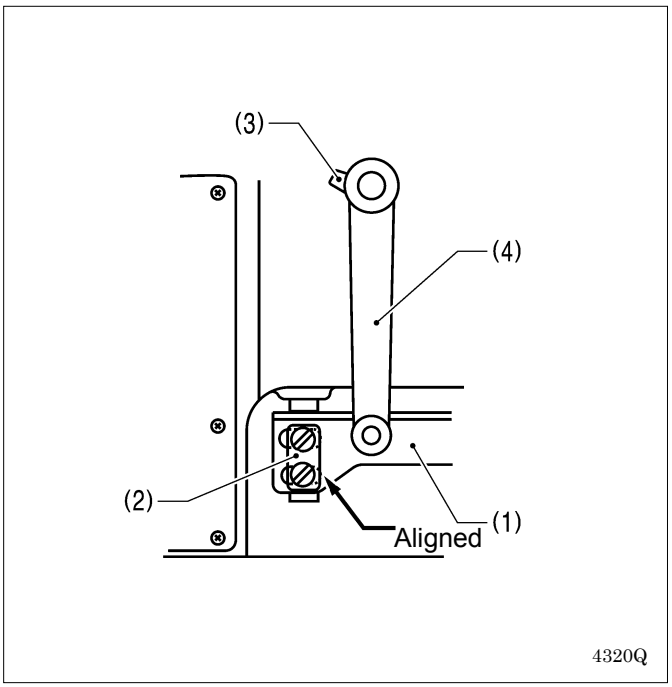
* After adjusting, push the upper thread scissors back to its original position (Fig. A in “4-12. Adjusting the cutter installation position”).

4-14. Adjusting the upper thread trimming

Upper thread trimming adjustment procedure	When adjusting for the first time	When the home position sensor position has been changed	When the longitudinal feed arm position has been changed	When the trimmer driving arm position has been changed	When the lateral position of the upper thread scissors has been changed	When the longitudinal position of the upper thread scissors has been changed	When the cutting depth of the upper thread scissors has been changed	When the installation height of the upper thread scissors has been changed	When the gradual opening timing of the upper thread scissors has been changed	When the opening timing of the upper thread scissors has been changed
4-4. Adjusting the work clamp home position sensor position  4311Q	1	1								
4-14-1. Adjusting the longitudinal feed arm assembly position  4312Q	2	2	1							
4-14-2. Adjusting the trimmer driving arm assembly position  4313Q	3	3	2	1						
4-14-3. Adjusting the lateral position of the upper thread scissors at the sewing start  4314Q	4				1					
4-14-4. Adjusting the longitudinal position of the upper thread scissors  4315Q	5					1				
4-14-5. Adjusting the cutting depth of the upper thread scissors  4316Q	6						1			
4-14-6. Adjusting the installation height of the upper thread scissors  4317Q	7							1		
4-14-7. Adjusting the upper thread scissors gradual opening timing  4318Q	8	4	3		2	2			1	
4-14-8. Adjusting the upper thread scissors opening timing  4319Q	9	5	4		3					1

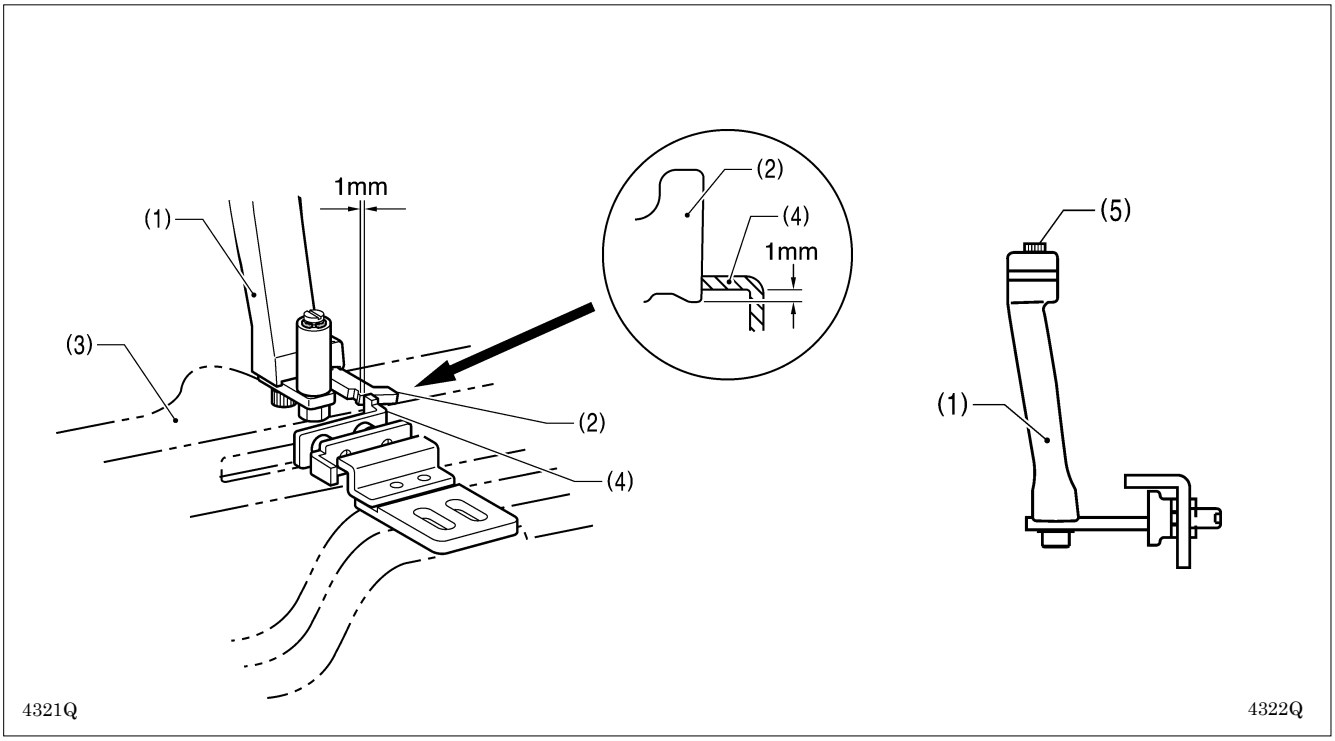
Note: Check the work clamp home position sensor position before adjusting the upper thread trimming.
(Refer to “4-4. Adjusting the work clamp home position sensor position”.)

4-14-1. Adjusting the longitudinal feed arm assembly position



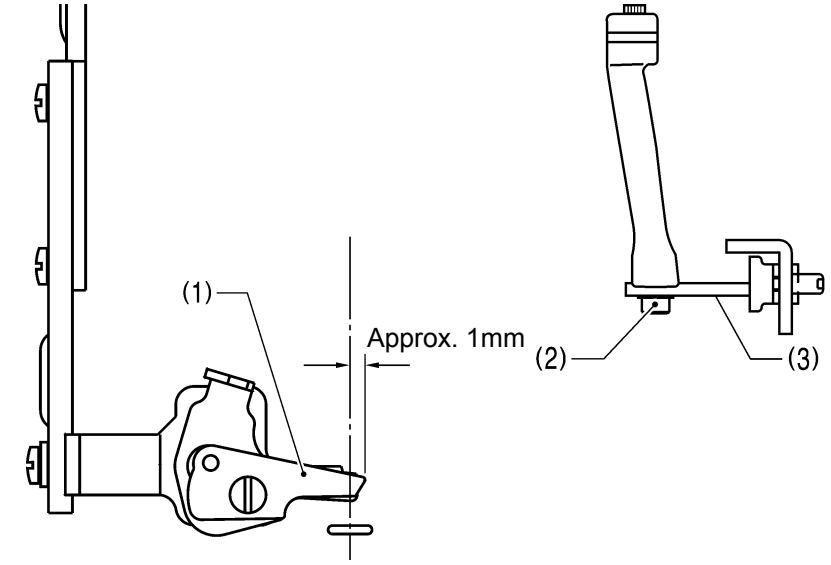
1. Turn on the power and set the sewing machine to the home position. Then press the RESET key to lower the work clamp.
2. Check that the slot at the bottom of the upper thread trimmer lever set (1) is aligned with the edge of the washer (2).
3. If they are not aligned, loosen the bolt (3) and move the longitudinal feed arm assembly (4) back and forth to adjust.

4-14-2. Adjusting the trimmer driving arm assembly position

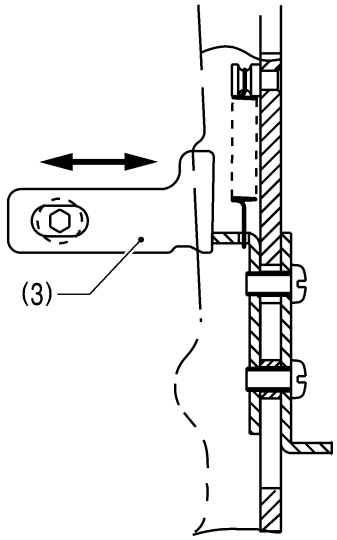


1. Turn on the power and set the sewing machine to the home position. Then press the RESET key to lower the work clamp.
2. Check that the overlap between the stopper (2) fixed to the trimmer driving arm assembly (1) with the bolt and the stop plate (4) of the upper thread trimmer lever set (3) is 1 mm.
3. If adjustment is necessary, loosen the bolt (5) and move the trimmer driving arm assembly (1) back and forward to adjust.

4-14-3. Adjusting the lateral position of the upper thread scissors at the sewing start



4323Q

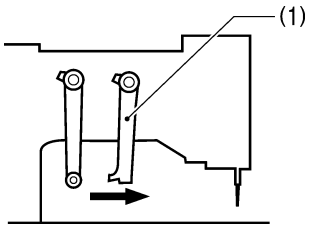


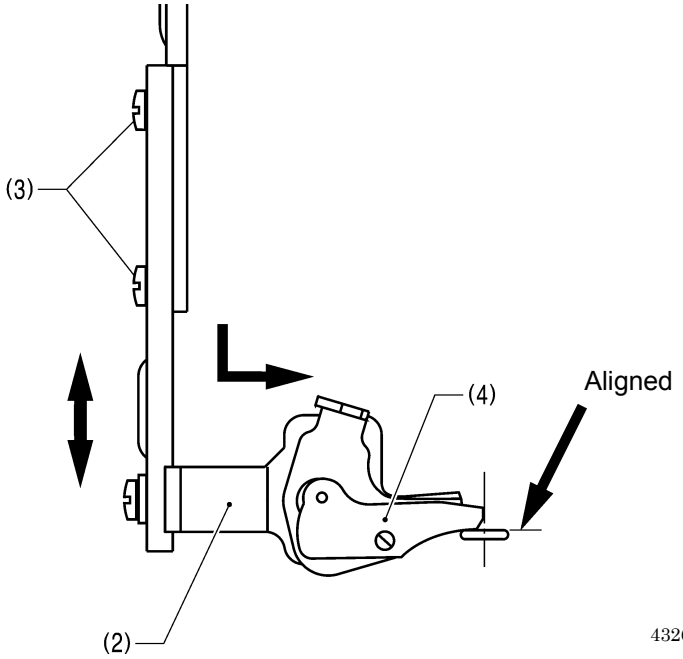
4324Q

1. Turn on the power and set the sewing machine to the home position. Then press the RESET key to lower the work clamp.
2. Loosen the bolt (2), and then move the stopper (3) in and out to adjust so that the edge of the upper thread scissors assembly (1) protrudes by approximately 1 mm from the center of the cutter.
   Note: If the amount of protrusion of the upper thread scissors assembly is too great, the scissors may touch the needle when they open.
3. After adjusting, carry out “4-14-8. Adjusting the upper thread scissors opening timing”.

4-14-4. Adjusting the longitudinal position of the upper thread scissors

4325Q





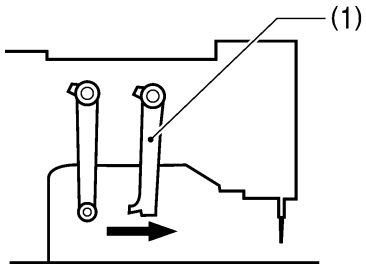
4326Q

1. Turn off the power (with the feed mechanism at the home position), and then slowly move the trimmer driving arm (1) forward until the upper thread scissors assembly (2) is at the position shown in the illustration.
2. Loosen the two screws (3), and then move the upper thread scissors assembly (2) back and forward to adjust so that the front ridge line of upper thread scissors U (4) is aligned with the edge of the needle hole.

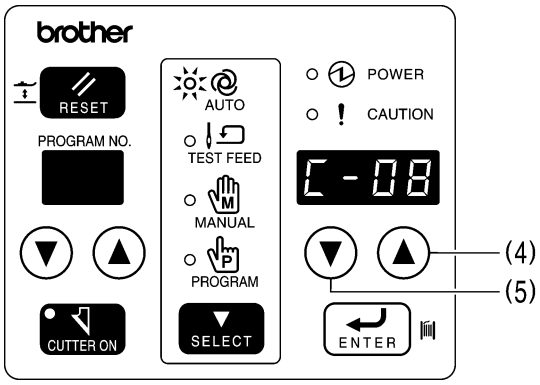
Note: If this adjustment is not carried out, it may result in thread trimming errors or needle breakages.

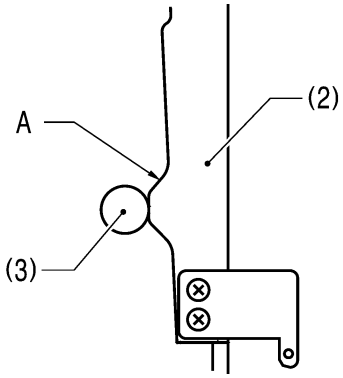
4-14-5. Adjusting the cutting depth of the upper thread scissors

4325Q

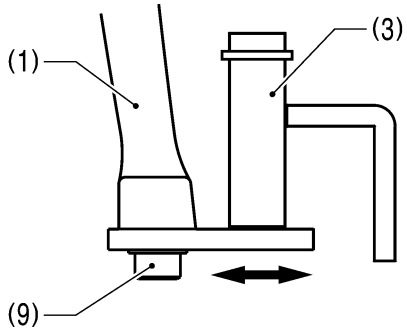


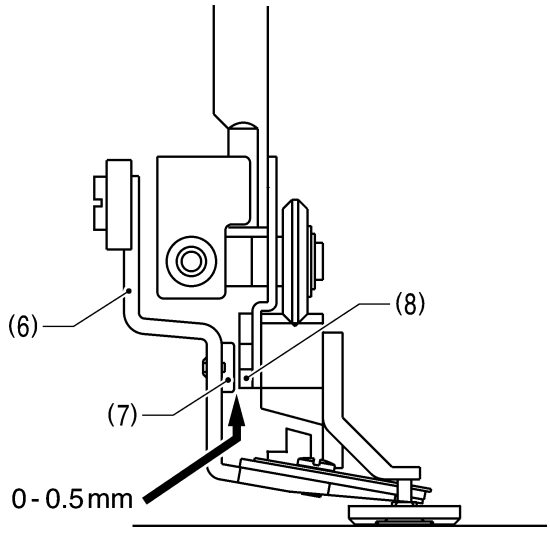
4328Q





4327Q





4329Q

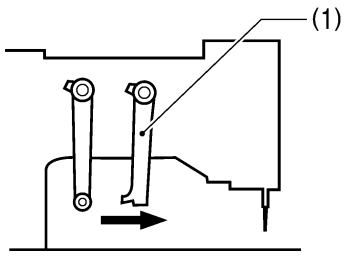
4330Q

1. Turn off the power (with the feed mechanism at the home position), and then slowly move the trimmer driving arm (1) forward until the driving arm roller (3) is at its highest position on the cam A of the upper thread trimmer lever (2). (Upper thread trimming position)
   * Using the output check code function can help with making this adjustment. If you press parameter keys (4) and (5) while operating at check code 08, the presser lifter pulse motor will operate one step at a time. (Refer to "6-8. Output check list".)
2. Loosen the bolt (9), and then adjust the driving arm roller (3) so that the clearance between the stopper (7) of the upper thread scissors assembly (6) and the opening cam bracket (8) is 0 - 0.5 mm.

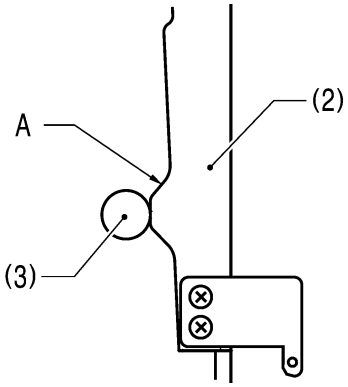
Note: If the stopper (7) is adjusted so that it presses too firmly, it may cause the presser foot lifter pulse motor to go out of step.

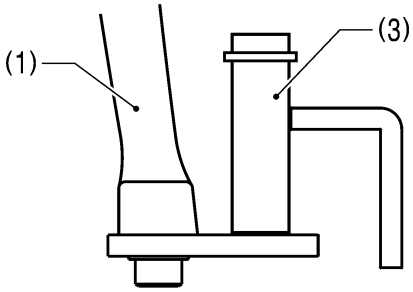
4-14-6. Adjusting the installation height of the upper thread scissors

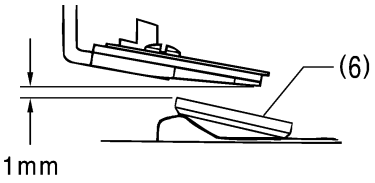
4325Q

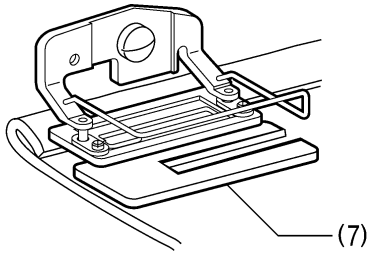


4331Q

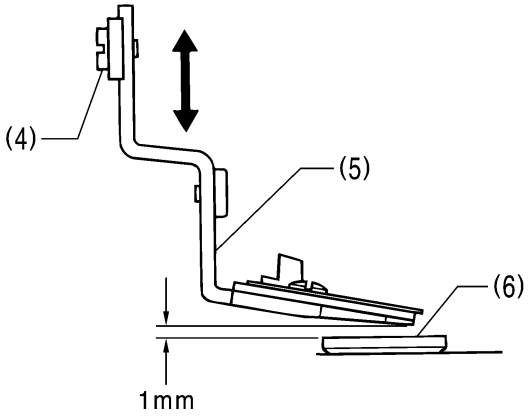




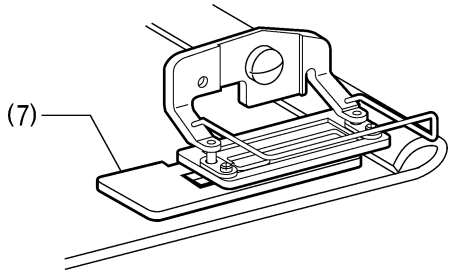




4332Q



4333Q



1. Turn off the power (with the feed mechanism at the home position), and then slowly move the trimmer driving arm (1) forward until the driving arm roller (3) is at its highest position on the cam A of the upper thread trimmer lever (2).
2. Loosen the screw (4), and then move the upper thread scissors (5) up or down to adjust the clearance between the upper thread scissors (5) and the work clamp (6) to approximately 1 mm.

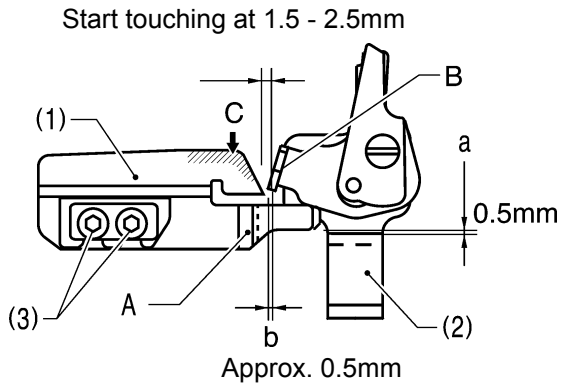
Note:

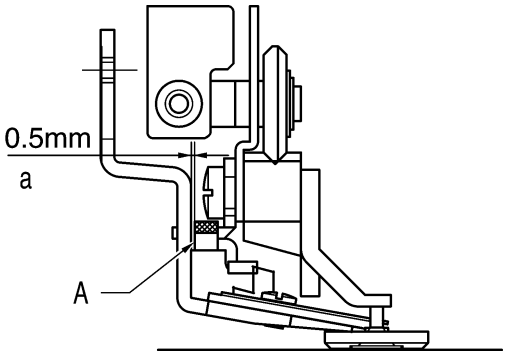
The work clamp (6) will tilt when sewing joints, so adjust so that the upper thread scissors (5) do not touch it. If the upper thread scissors (5) touch the work clamp (6), the work clamp lifter pulse motor may get out of step.

* If the tilting of the work clamp (6) causes skipped stitches to occur when sewing material joints, use the accessory auxiliary sheet (7) as shown in the illustration.

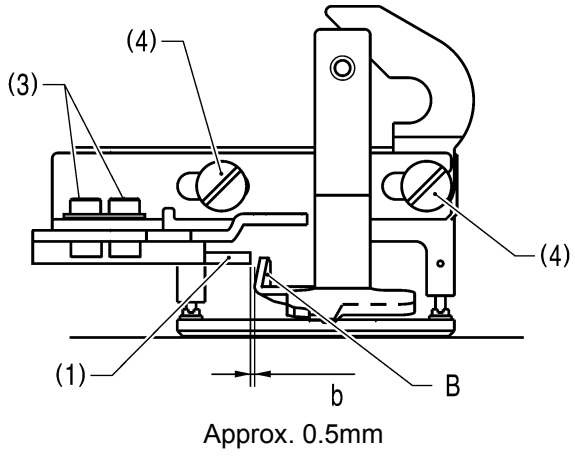
4-14-7. Adjusting the upper thread scissors gradual opening timing

4334Q





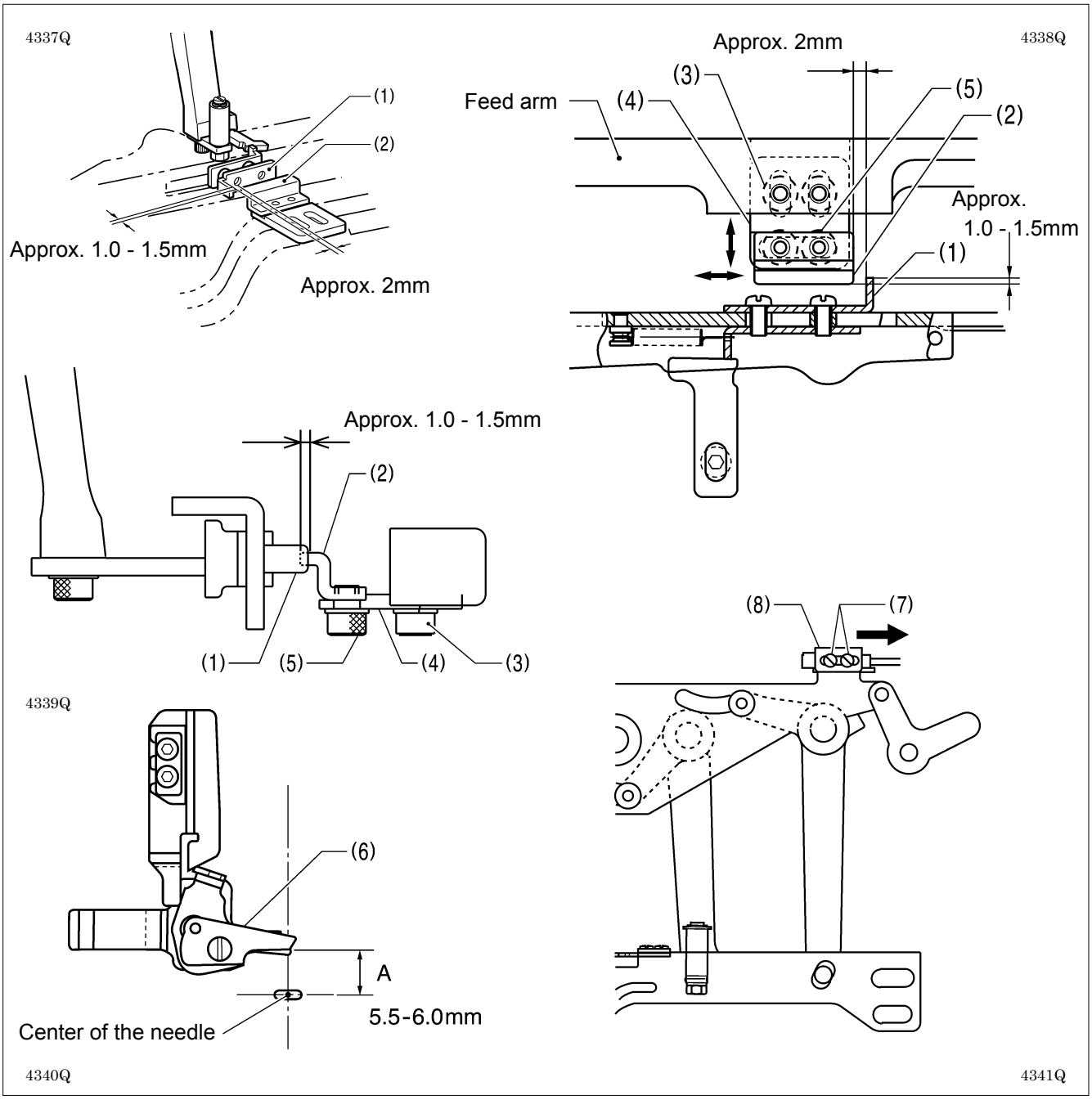
4335Q



4336Q

1. Turn on the power and set the sewing machine to the home position. Then press the RESET key to lower the work clamp.
2. Loosen the two bolts (3), and then adjust so that the distance a between ridge line A on the opening cam (1) and the upper thread scissors (2) is 0.5 mm, and so that ridge line A on the opening cam is parallel to the feed direction.
3. Loosen the two screws (4), and then adjust so that the distance b between the rising section B of the upper thread scissors (2) and the tip of the opening cam (1) is approximately 0.5 mm when the upper thread scissors (2) are closed.
   * If you would like the scissors to start opening earlier, make the distance smaller. However, if you make the distance smaller, check that the rising section B of the upper thread scissors (2) does not touch the opening cam (1) and prevent the upper thread scissors (2) from opening when the work clamp is lowered.
4. Apply grease to the inclined face C of the opening cam (1).
5. Check that the upper thread scissors (2) gradually start opening after the material has been fed by 1.5 - 2.5 mm.

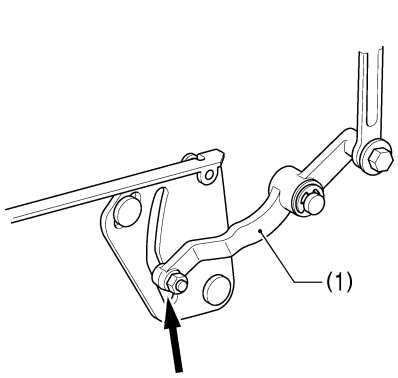
4-14-8. Adjusting the upper thread scissors opening timing



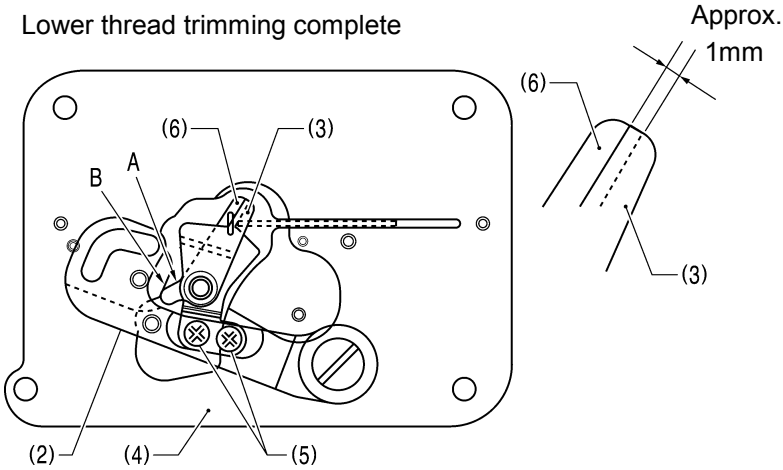
1. Turn on the power and set the sewing machine to the home position. Then press the RESET key to lower the work clamp.
2. Loosen the two bolts (3), and then adjust the support plate (4) so that the back plate (1) and the cam (2) overlap by approximately 1.0 – 1.5 mm.
   Note: If the amount of overlap is too small, the upper thread scissors will not open properly and the upper thread scissors and the cutter may touch each other.
3. Loosen the two bolts (5), and then adjust the clearance between the bend in the back plate (1) and the cam (2) to approximately 2 mm.
   * If you would like the scissors to start opening earlier, make this clearance smaller.
4. Check that the distance A between the upper thread scissors (6) and the center of the needle is 5.5 - 6 mm.
5. If the distance A is outside the range of 5.5 – 6.0 mm, loosen the two screws (7) and move the dog (8) in the direction of the arrow slightly, and then tighten the screws (7).
6. Turn the power back on, set the sewing machine to the home position and then press the RESET key to check the distance A.
7. Check the operation in test feed mode.
   * Refer to the operating procedure given in “1-10. Upper thread trimmer mechanism”.

4-15. Adjusting the lower thread trimming

4-15-1. Adjusting the lower thread trimmer fixed knife engagement amount



4342Q

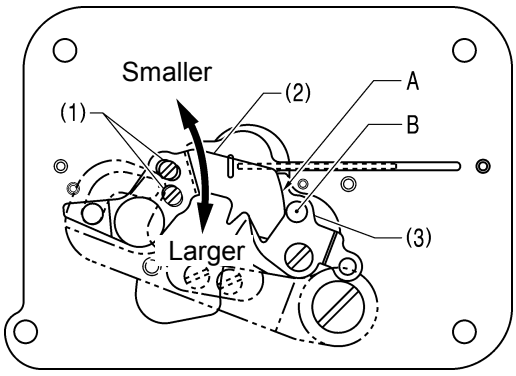


4343Q

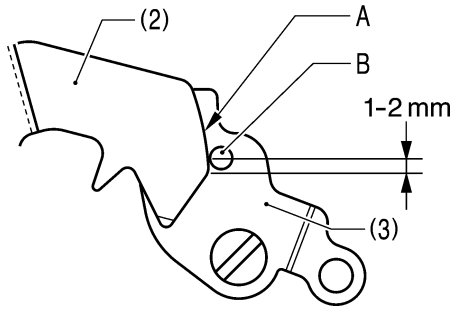
1. With the power turned off, move the lower thread trimmer cam lever (1) in the direction of the arrow so that the knife driving lever (2) is in the position shown in the illustration.
2. Check that the cam A of the movable knife (3) is sitting securely on top of the cam B of the base plate (4).
3. Loosen the two screws (5), and then adjust so that the fixed knife (6) and the movable knife (3) are engaged by approximately 1 mm.

* If the engagement amount is too small, the lower thread may not be fully cut, and the material may get caught when it is removed after sewing.

4-15-2. Adjusting the lower thread retaining amount



4344Q



4345Q

1. Turn on the power and set the sewing machine to the home position.
2. Loosen the two screws (1), and then adjust the lower thread retainer (2) to a distance of 1 - 2 mm as shown in the illustration.

* If the lower thread retaining amount has been reduced, check that the roller B of the lower thread clamp plate (3) is sitting securely on top of the lower thread retainer cam A.
* If the lower thread is pulling up at the first stitch at the sewing start, check if the lower thread is not being pulled out of the lower thread clamp plate (3), and that it is not too loose when it is coming out from the bobbin case.

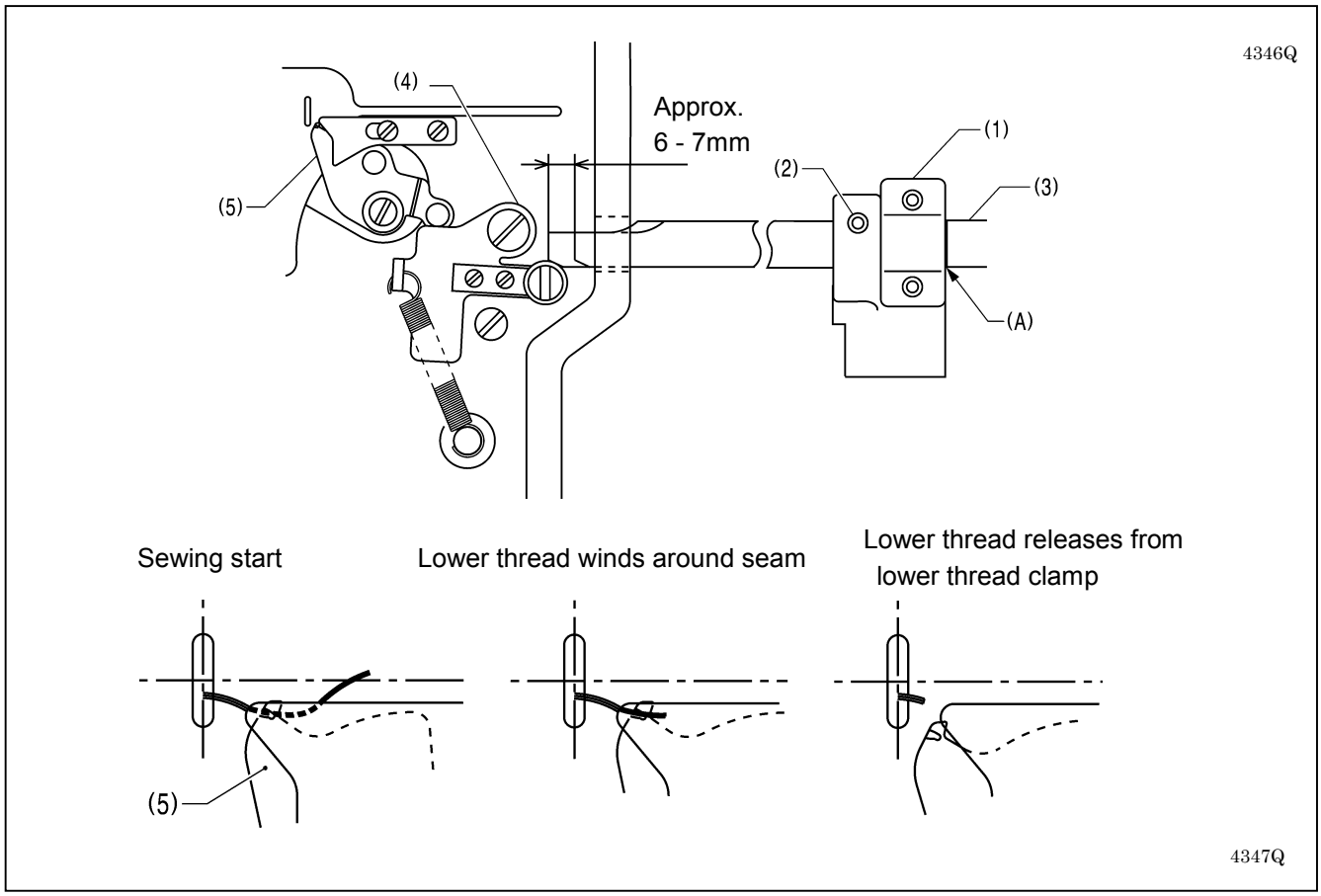
If the lower thread retaining amount is too small

The lower thread will pull out of the lower thread clamp plate e at the first stitch at the sewing start, which can cause problems such as lower thread cast-off, lower thread loops or poor lower thread winding.

If the lower thread retaining amount is too great

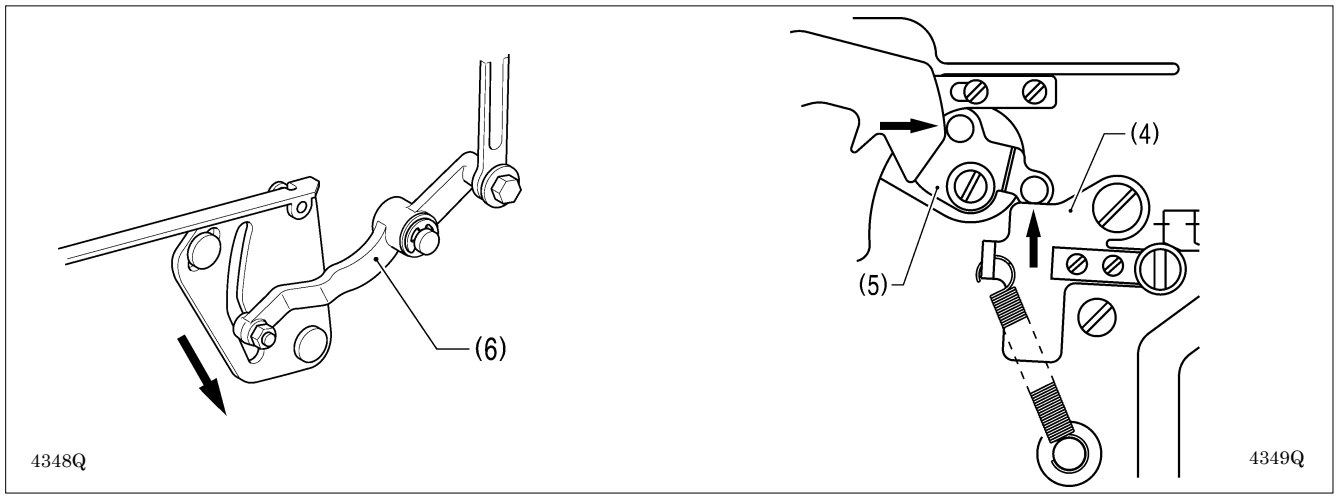
This can cause problems such as poor sealing at the sewing start, or wound lower thread sticking out of the rear tack.

4-15-3. Adjusting the lower thread clamp opening timing



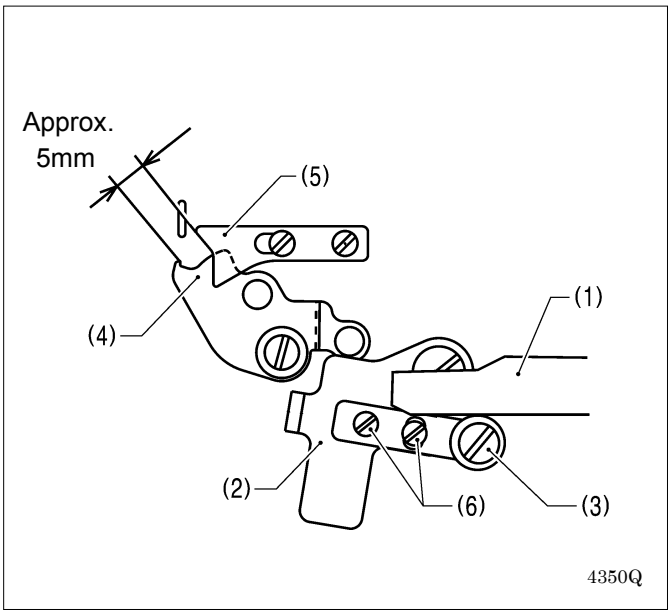
1. Loosen the set screw (2) of the feed arm support (1), and then align reference line A of feed guide shaft B (3) with the edge of the feed arm support (1).
2. When the feed mechanism moves by 6 - 7 mm, the opening plate (4) moves and the lower thread clamp (5) opens.
3. To change the opening timing, loosen the set screw (2) and move the feed guide shaft B (3) to the left or right to adjust.

* The end of the thread which is being held by the lower thread clamp (5) is wound around inside the seam. If the opening timing is too early, it can cause problems such as poor winding or pulling-up of the lower thread. If the opening timing is too late, it can cause problems such as stretching, uneven seams or bird's nests at the sewing start, depending on the type of material.



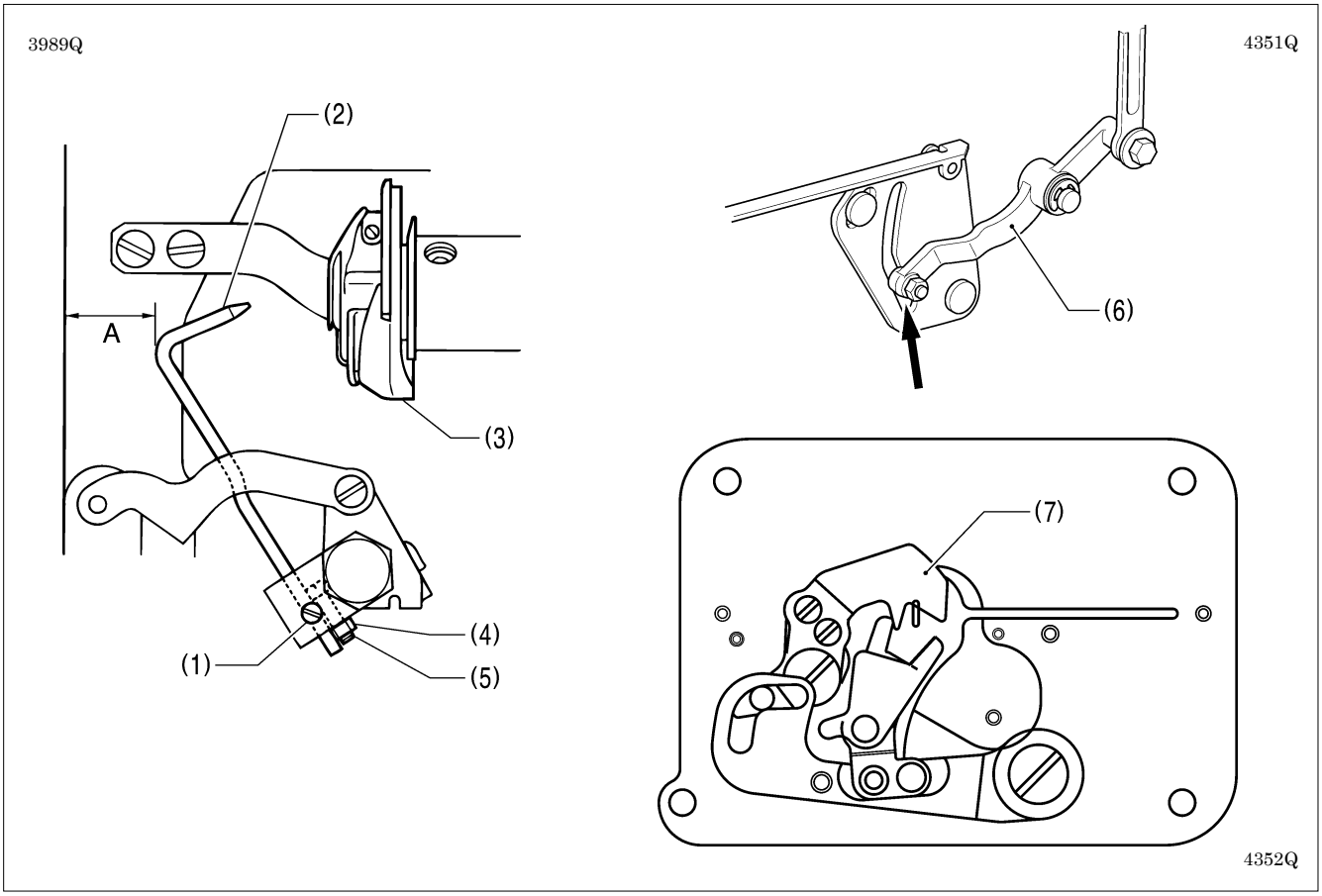
Note: After moving the lower thread trimmer cam lever (6) back in the direction of the arrow, move the feed mechanism.
If the feed mechanism is moved when the lower thread trimming has been carried out, the mechanisms will press against each other, which may result in damage to the lower thread clamp (5) and the opening plate (4).

4-15-4. Adjusting the lower thread clamp opening amount



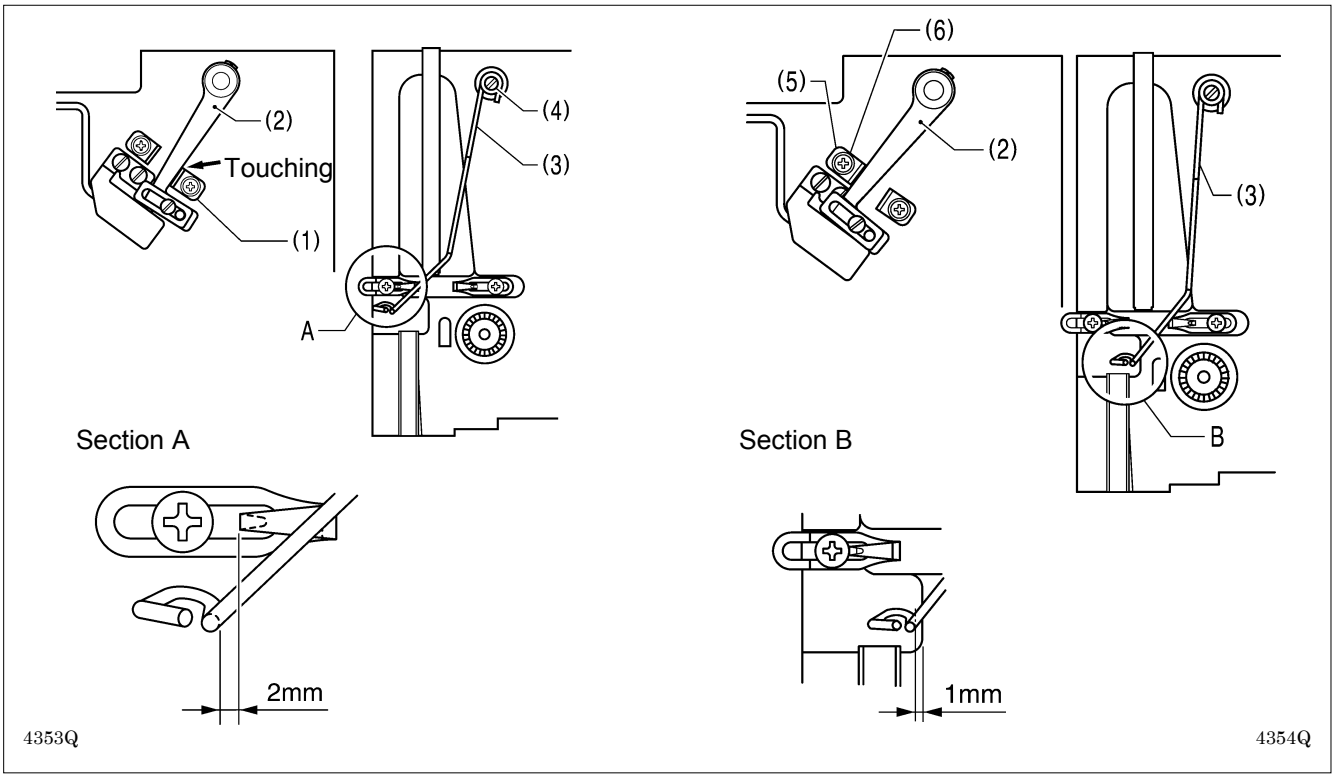
Loosen the two screws (6), and then adjust so that the distance between the lower thread clamp (4) and the lower thread presser (5) is approximately 5 mm when the feed guide shaft (1) is projecting out at the front and is firmly touching the roller (3) of opening plate (2).

4-16. Adjusting the bobbin presser

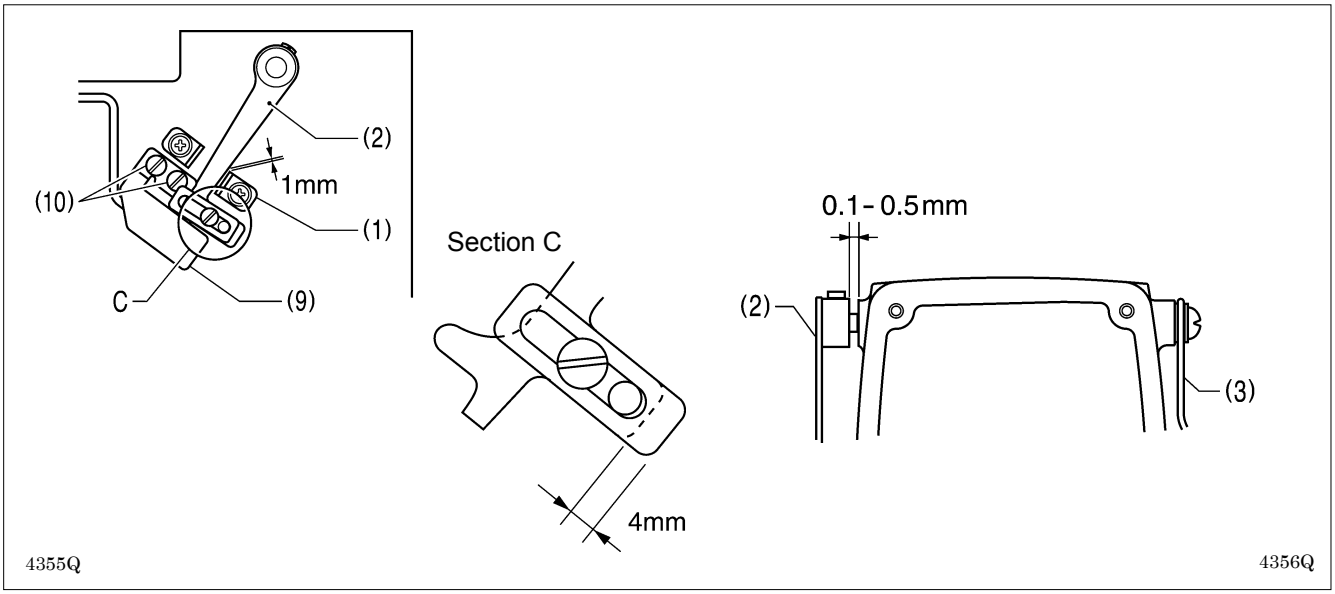


1. Turn on the power and set the sewing machine to the home position. Then press the RESET key to lower the work clamp.
2. Loosen the set screw (1), and then adjust so that the bobbin presser (2) goes into the hole in the bobbin case (3).
3. Check that the work clamp is at the home position, and then loosen the nut (4) and turn the screw (5) to adjust the clearance A between the bobbin presser (2) and the edge of the bed to approximately 12.5 mm.
4. Turn off the power, move the lower thread trimmer cam lever (6) by hand in the direction of the arrow to check that the bobbin presser (2) presses the bobbin firmly before the lower thread retainer (7) starts to hold the lower thread.
   Note: If this timing is reversed, it will cause problems such as an excess trailing length of upper thread.

4-17. Adjusting the thread breakage detector

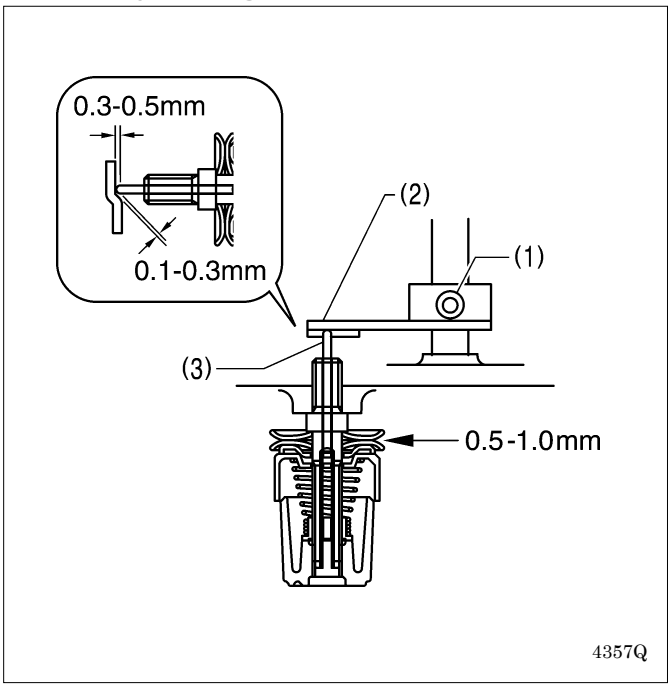


1. Tighten the lever stopper (1) inside the slotted hole.
2. Loosen the screw (4), and then adjust so that the distance A at the thread guide (3) is 2 mm when the thread breakage detector lever (2) contacts the lever stopper (1).
3. Loosen the screw (6) of the lever stopper (5), and then adjust so that the distance B at the thread guide (3) is 1 mm when the thread breakage detection lever (2) contacts the stopper (5).



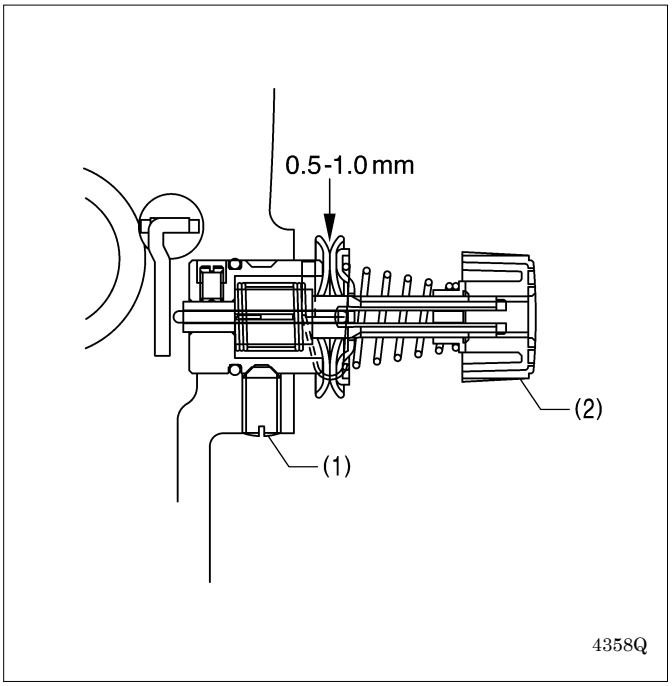
4. Loosen the screw (7), and then adjust so that the distance C at the balancer (8) is 4 mm.
5. Turn on the power and set the sewing machine to the home position. Then press the RESET key to lower the work clamp.
6. Loosen the two screws (10), and then adjust so that the thread breakage detector sensor (9) turns on (LED illuminates) when the distance between the thread breakage detection lever (2) and the lever stopper (1) is 1 mm.
7. When the thread guide (3) is moved to position B and then released, check that it moves smoothly back to position A.
8. If the thread guide (3) does not move smoothly, check that the clearance between the thread breakage detection lever (2) and the arm is 0.1 - 0.5 mm.

4-18. Adjusting the thread tension at the tack tension control



1. Turn on the power and set the sewing machine to the home position. Then press the RESET key to lower the work clamp.
2. Loosen the set screw (1), and then adjust the clearances between the tension release cam (2) and the tension release pin (3) as shown in the illustration.
3. Press the RESET key and check that the tension disc opening amount is 0.5-1.0 mm when the work clamp is raised.
4. Press the RESET key once more and check that the tension discs are fully closed when the work clamp is lowered.

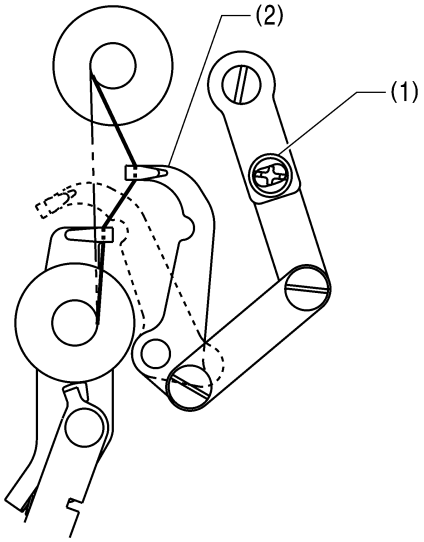
4-19. Adjusting the thread tension at the zigzag tension control



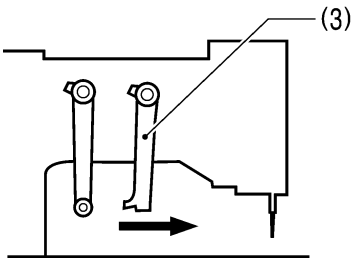
Position the tension release solenoid as described in "3-7. Tension release mechanism (1)" before carrying out this adjustment.

1. Turn on the power and set the sewing machine to the home position. Then press the RESET key to lower the work clamp.
2. Loosen the set screw (1), and then move the tension stud bracket assembly (2) in and out to adjust so that the tension disc opening amount is 0.5 - 1.0 mm.
3. Check that the tension discs are fully closed when the power is turned off.

4-20. Adjusting the upper thread feeding amount



4359Q

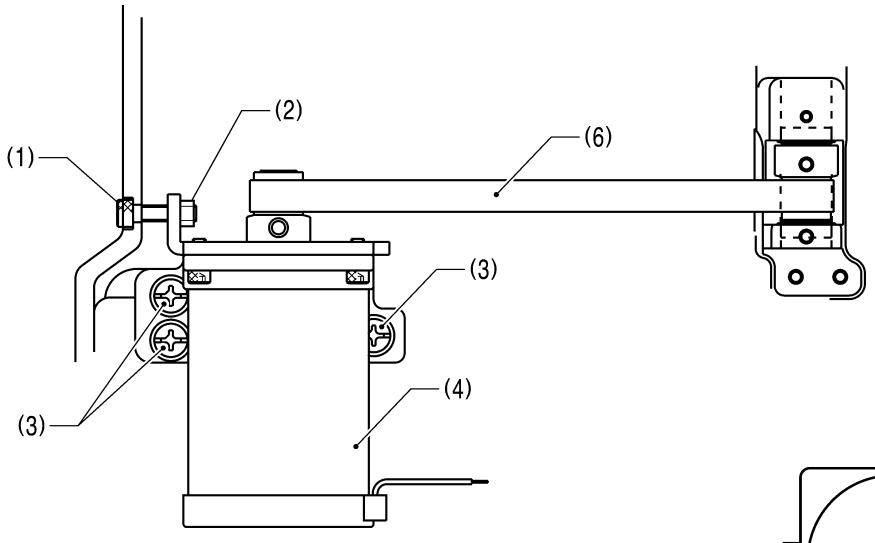


4360Q

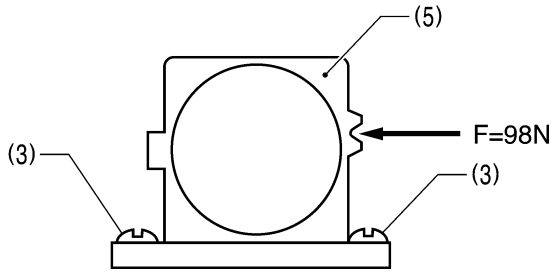
1. Loosen the screw (1), and then turn the tension take-up lever (2) to adjust the upper thread feeding amount.
2. Move the trimmer driving arm (3) by hand and check that upper thread feeding is completed before the upper thread is cut.

Note: If the above adjustment is not made, it may result in the upper thread pulling out or in upper thread clamping errors.

4-21. Adjusting the feed timing belt



4361Q

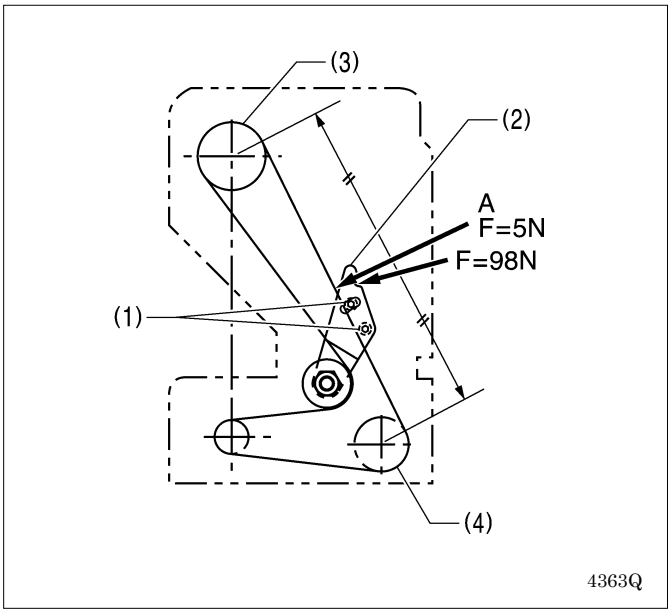


4362Q

1. Remove the bolt (1) and the nut (2).
2. Loosen the three screws (3) so that the feed pulse motor (4) moves easily.
3. While using a spring gauge to push the notch in the motor mounting bracket (5) with a force of 98 N, tighten the screws (3).
4. Check that the timing belt (6) moves smoothly.
5. Gently tighten the bolt (1) and the nut (2).

* If you do not have a spring gauge, adjust the tension with the bolt (1) and the nut (2) so that the amount of belt deflection is approximately 3.5 mm when a force of 5 N is applied in the middle of the belt span. Then tighten the three screws (3).

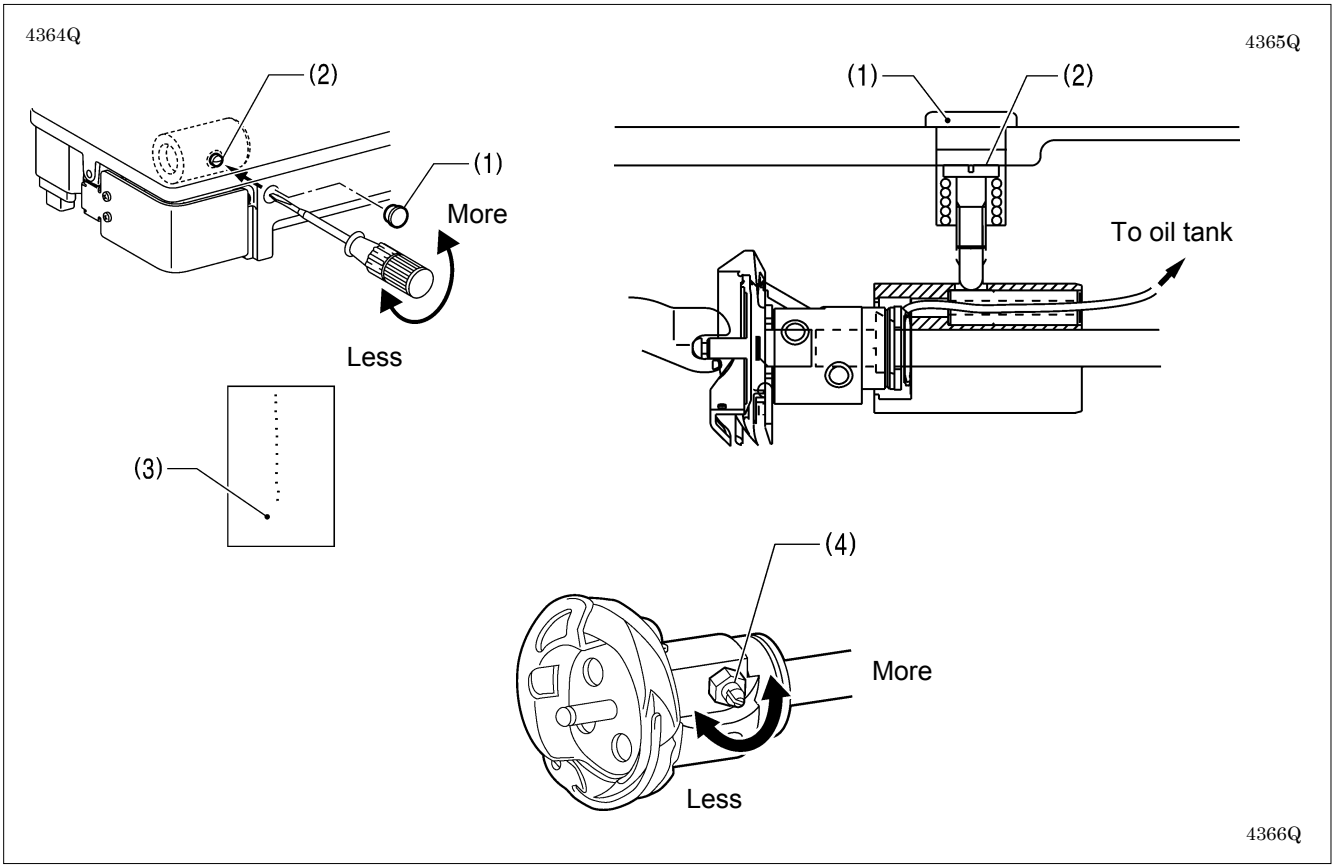
4-22. Adjusting the upper shaft timing belt



1. Loosen the two bolts (1).
2. Use a spring gauge to push the notch in the tension pulley plate (2) with a force of 98 N, and then tighten the bolts (1).

* If you do not have a spring gauge, adjust the tension so that the amount of belt deflection is approximately 5 mm when a force of 5 N is applied in the middle of the belt span between timing pulley U (3) and the idle pulley (4) in the place indicated by arrow A.

4-23. Adjusting the rotary hook lubrication



1. Remove the rubber cap (1).
2. Turn the adjusting screw (2) to adjust the lubrication amount.

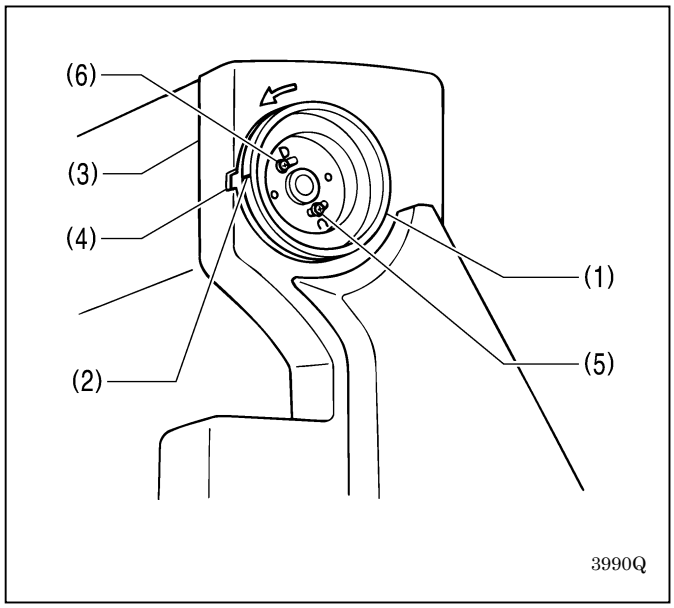
* Adjust so that approximately 10 drops of oil are released when the sewing machine is run at a speed of 4,000 rpm for three cycles to sew about 114 stitches. Use Kraft paper (3) or similar to catch the oil drops. As a guide, the optimum position can be obtained if the adjusting screw (2) is tightened as much as possible and then loosened about two turns.

* Furthermore fine adjustments can then be made using the rotary hook joint screw (4).

* If the lubrication amount has been reduced, run the machine for 200 - 300 sewing cycles and then check it again.

Note: If lubrication stops, it will cause problems such as rotary hook seizure and thread breakages.

4-24. Adjusting the needle up stop position



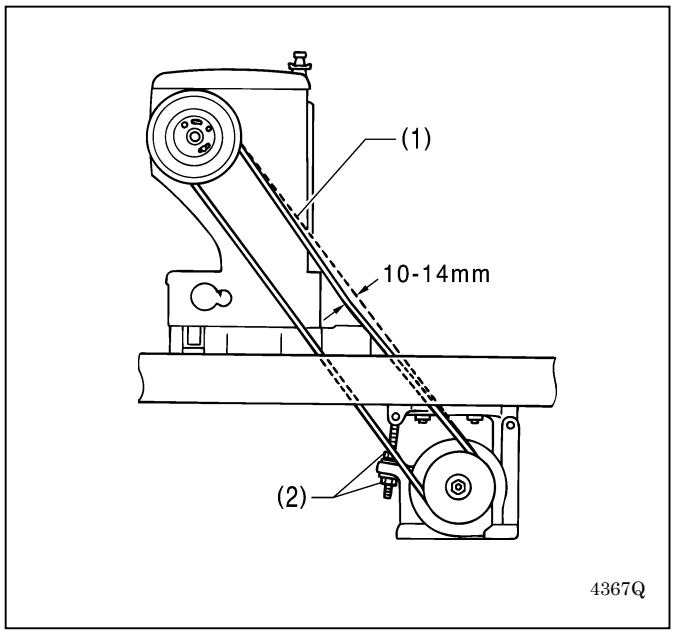
The needle up stop position is adjusted so that the index mark (2) on the machine pulley (1) is inside the mark (4) on the belt cover (3).
If adjustment is necessary, loosen the screw (5) of the machine pulley (1). The machine pulley (1) will stop more slowly if the screw (5) is moved counter to the normal direction of rotation, and will stop more quickly if the screw (5) is moved in the normal direction of rotation.

Note:

The screw (6) at the “D” mark is an adjusting screw for the needle down detection function and is adjusted to match the feed timing, so it should not be loosened.

* If the index mark (2) is not inside the mark (4) when the sewing machine is started, and error code “E-02” will be displayed. Turn the machine pulley to move the index mark (2) to the correct position and then start the sewing machine.

4-25. Adjusting the V-belt tension



1. Remove the three screws, and then remove the belt cover.
2. Turn the two nuts (2) to adjust so that there is 10 - 14 mm of deflection in the V-belt (1) when it is pressed at the midway point with a force of 5 N.

Note:

If the V-belt tension is too loose, or if the V-belt is stretched, the following problems could occur.

a. The stopping position may shift,
b. The needle bar may drift when the machine stops,
c. An extra stitch may be sewing when the machine stops,
d. An abnormal noise may be heard due to V-belt slipping, and
e. The V-belt may become too loose and contact with the cover.

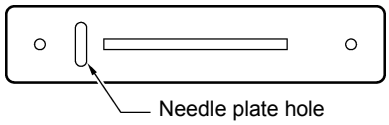
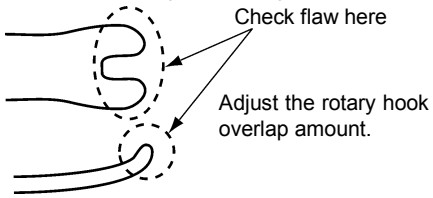
If any such problems occur, adjust by following the procedure described above.

5. TROUBLESHOOTING

⚠ CAUTION

Turn off the power switch and disconnect the power cord before carrying out troubleshooting, otherwise the machine may operate if the treadle is depressed by mistake, which could result in injury.

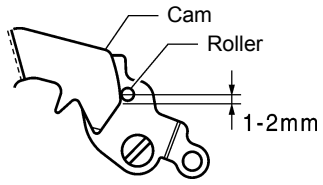
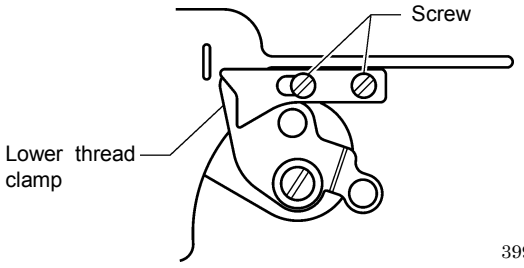
5-1. Upper thread breakage

Cause	Check	Remedy	Page
Needle	Needle facing	As viewed from the direction of the face plate, attach needle so that the notched part of needle faces frontward.	Instruction manual
	Needle installation height	Insert the end of the needle shank so that it touches the top edge of the needle hole of the needle bar.	-
	Bent needle	Replace needle	-
	Blunt needle tip or burr	Replace needle	-
	Needle and thread	Replace needle that fits the thread	-
Threading	Upper thread threading	Thread the upper thread correctly.	Instruction manual
	Lower thread threading	Thread the lower thread correctly.	Instruction manual
Thread path	Flaw or abrasion on the thread path	Polish with buff or replace the part. Especially, pay attention to finishing around needle plate hole.  3996Q	-
	Flaw on the rotary hook point and rotary hook edge	Polish with buff or replace the part.	-
	Flaw on the rotary hook holder	Polish with buff or replace the part.  3997Q	85
Thread tension	Zigzag thread upper thread tension	Adjust the upper thread tension appropriately.	Instruction manual
	Bar tack thread upper thread tension	Adjust the upper thread tension while checking stitches. (The stitches on top are the upper thread and the stitches underneath are the bobbin thread.)	Instruction manual
Thread take-up spring	Thread take-up spring tension and stroke	Loosen the thread take-up spring tension or shorten the stroke to such a degree that does not cause double hooking. Adjust it while checking bar tacking stitches.	Instruction manual

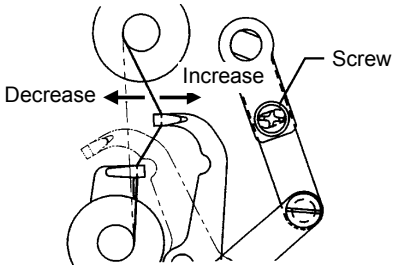
Cause	Check	Remedy	Page
Rotary hook	Needle bar height and needle bar lift amount	Adjust the needle and hook timing. 1. Adjust the needle bar height to “1” on the gauge. 2. Adjust the needle bar lift amount to “2” on the gauge.	83
	Gap between needle and rotary hook	Adjust the gap between needle and rotary hook to 0.01 - 0.08 mm. (Adjust to as large as possible without causing skipped stitches to occur.) * Check that rotary hook point does not strike needle in zigzag motion.	84
	Rotary hook lubrication	· Too small quantity of lubrication oil will cause thread breakage. Adjust the quantity of lubrication oil. · The lubrication holes between rotary hook and rotary hook joint do not match up.	102 77
	Thread twisted around rotary hook	Remove any twisted thread from the inner and rotary hook.	-
Upper thread amount	Arm thread guide position	Adjust the arm thread guide position	Instruction manual
Bobbin case	Damaged outside of bobbin case and bent bobbin holder spring, etc.	Polish with buff or replace the part. * Use the HE-800A bobbin case.	-

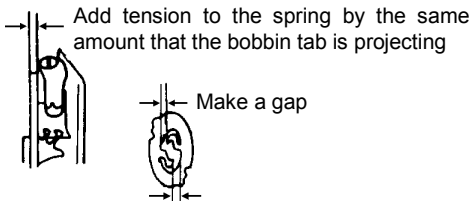
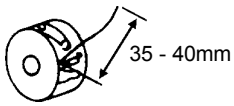
5-2. Skipped stitches

Cause	Check	Remedy	Page
Needle	Needle facing	As viewed from the direction of the face plate, attach needle so that the notched part of needle faces frontward.	Instruction manual
	Needle installation height	Insert the end of the needle shank so that it touches the top edge of the needle hole of the needle bar.	-
	Bent needle	Replace needle	-
	Blunt needle tip or burr	Replace needle	-
	Thin needle	Use a needle with a count that matches the thread and material.	-
Thread take-up spring	Thread take-up spring tension and stroke	Loosen the thread take-up spring tension or shorten the stroke to such a degree that does not cause double hooking. Adjust it while checking bar tacking stitches.	Instruction manual
Work clamp	Work clamp pressure	Increase work clamp pressure. * The standard height of the adjustment screw is approximately 30 mm, so tighten it further than this.	85
	Relation between work clamp assembly and sewing length	Replace work clamp assembly that fits for sewing length. * When using knits or woven materials, replace the parts with the –3 specification parts: Length feed plate (for specification -3), work clamp assembly (for knits), needle plate 1.2 (for specification -3)	-
Rotary hook	Blunt rotary hook point	Polish with buff or replace the part.	-
	Needle bar height and needle bar lift amount	Adjust the needle and hook timing. 1. Adjust the needle bar height to “1” on the gauge. 2. Adjust the needle bar lift amount to “2” on the gauge.	83
	Gap between needle and rotary hook	Adjust the gap between needle and rotary hook to 0.01 - 0.08 mm. (Adjust to as large as possible without causing skipped stitches to occur.) * Check that rotary hook point does not strike needle in zigzag motion.	84

Cause	Check	Remedy	Page
Thread tension	Zigzag thread upper thread tension	Adjust the upper thread tension appropriately.	Instruction manual
Needle bar plate	Vertical and longitudinal needle bar play	Reduce the needle bar play, or replace the parts.	-
Lower thread clamp	Lower thread retainer cam	Lower thread retainer cam should be sitting firmly on lower thread clamp plate roller. 	96
	Thread scraps and dust blocking area around lower thread clamp and lower thread presser	Clean around the lower thread presser.	-
	Lower thread clamping force	· If the lower thread clamp and lower thread presser are bent, replace them. · Check that the screws are tightened. 	-
Needle plate	Relation between material and needle plate	· When using knit material, replace with the –3 needle plate. · Replace with a needle plate with a smaller needle hole.	-
Joint sewing	Angle of work clamp means that material is not being clamped.	· Replace with short work clamp that matches the sewing length. · Use the accessory auxiliary sheet. · Process the work clamp assembly to match the joint section. (Attach or remove rubber.)	93

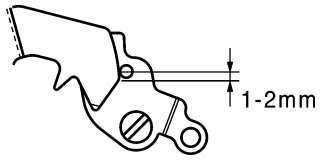
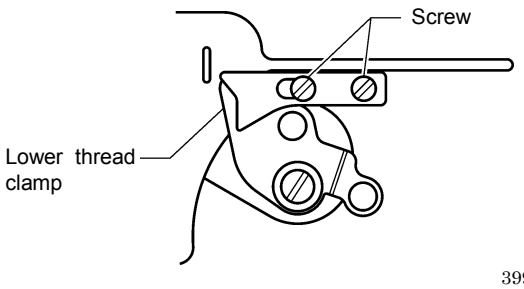
5-3. Uneven seams (1) …… At the sewing start

Cause	Check	Remedy	Page
Upper thread scissors	Installation height	Adjust the upper thread scissors installation height.	93
	Upper thread scissors opening timing	Adjust to an appropriate opening timing.	94, 95
	Upper thread scissors operation	Apply grease to the inclined face of the opening cam.	94
Upper thread feeding	Thread take-up amount	Loosen the screw to decrease thread take-up amount so that upper thread does not pull out of scissors assembly at the sewing start. 	101

Cause	Check	Remedy	Page
Lower thread (bobbin slip)	Lower thread tension	Adjust the lower thread tension appropriately.	Instruction manual
	Bobbin holder spring	Add tension to the bobbin holder spring.  4001Q	-
	Lower thread retainer position	Adjust the lower thread retainer position. * Adjust lower thread retainer so that a 35 – 40 mm thread leader is left after trimming.  4002Q	96
	Bobbin presser position	Adjust the bobbin presser position.	98
	Bobbin insertion	Insert the bobbin correctly.	Instruction manual
	Work clamp lifting speed	Reduce the setting for memory switch No. 02.	Instruction manual

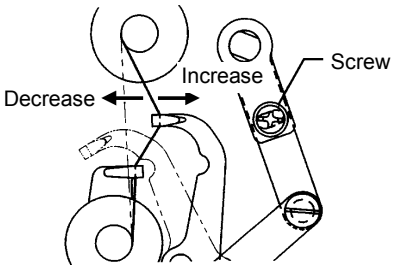
5-4. Uneven seams (2) …… Lower thread is lifted up at the sewing start

The end of the lower thread protrudes above the seam at the sewing start

Cause	Check	Remedy	Page
Lower thread retainer	Lower thread retaining amount	Adjust the lower thread retaining amount.  4003Q	96
Lower thread clamp	Lower thread clamp opening timing	Adjust so that the lower thread clamp plate opens when the feed mechanism moves 6 – 7 mm.	97
	Lower thread clamping force	· If the lower thread clamp and lower thread presser are bent, replace them. · Check that the screws are tightened.  3999Q	-

5-5. Uneven seams (3) ……Seam lifts up at the sewing start

Seam lifts up and does not tighten at the sewing start

Cause	Check	Remedy	Page
Upper thread scissors	Upper thread scissors gradual opening timing	Adjust the timing so that the upper thread scissors gradually start opening when the feed mechanism moves about 1.5 - 2.5 mm.	94
	Upper thread scissors operation	Apply grease to the inclined face of the opening cam.	94
Upper thread feeding	Thread take-up amount	Loosen the screw to decrease thread take-up amount so that upper thread does not pull out of scissors assembly at the sewing start. 	101

5-6. Uneven seams (4) …… Uneven sewing pitch at the sewing start

Bird's nests form at the sewing start, and after 5 – 6 mm the sewing pitch suddenly increases

Cause	Check	Remedy	Page
Lower thread clamp	Lower thread clamp opening timing	Advance the timing at which the lower thread clamp starts to open.	97

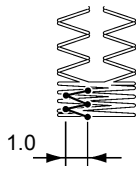
5-7. Uneven seams (5)……Poor rounding of seam

Cause	Check	Remedy	Page
Thread tension	Zigzag thread upper thread tension	Adjust the upper thread tension appropriately.	Instruction manual
	Zigzag tension disc opening	· Check the opening of the zigzag tension discs. · Replace the tension release solenoid.	100
	Lower thread tension	Adjust the lower thread tension appropriately.	Instruction manual
Threading	Upper thread threading	Thread the upper thread correctly.	Instruction manual
	Lower thread threading	Thread the lower thread correctly.	Instruction manual
Stitch patterns	Purl stitch, whip stitch	Set using parameter number 11.	Instruction manual
Tension release	Tension release timing	Use parameter numbers 63 to 66 to change the tension release on and off timing.	Instruction manual

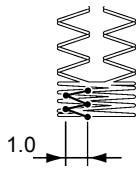
5-8. Uneven seams (6) …… Around rear tack or front tack

Cause	Check	Remedy	Page
Tension release	Tension release timing	Use parameter numbers 63 to 66 to change the tension release on and off timing.	Instruction manual
Threading	Upper thread threading	Thread the upper thread correctly.	Instruction manual
	Lower thread threading	Thread the lower thread correctly.	Instruction manual
Zigzag thread tension	Zigzag tension disc opening	· Adjust the tension disc opening amount. · Check the opening of the zigzag tension discs. · Replace the tension release solenoid.	100
Upper thread scissors	Upper thread scissors operation	Apply grease to the inclined face of the opening cam.	94

5-9. Uneven seams (7) …… Loose thread end at end backtack

Cause	Check	Remedy	Page
Backtack shape	Check the backtack shape	Set the value for parameter No. 68 to 1.0. * If the value is set to 1.0, the rear tack will change.  4004Q	Instruction manual

5-10. Uneven seams (8) …… Thread sticking out at end backtack

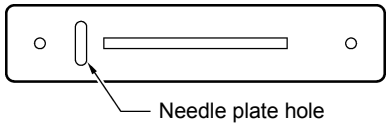
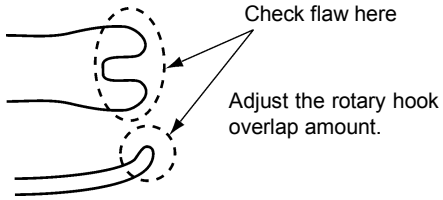
Cause	Check	Remedy	Page
Backtack shape	Check the backtack shape	Set the value for parameter No. 68 to 1.0. * If the value is set to 1.0, the rear tack will change.  4004Q	Instruction manual
Uneven material feeding	Work clamp pressure	Increase work clamp pressure. * The standard height of the adjustment screw is approximately 30 mm, so tighten it further than this.	85
	Work clamp	When using knit material, replace with the –3 work clamp and needle plate.	-
	Upper thread scissors opening timing	Adjust to an appropriate opening timing.	94, 95
	Upper thread scissors operation	Apply grease to the inclined face of the opening cam.	94
	Lower thread clamp opening timing	Adjust so that the lower thread clamp plate opens when the feed mechanism moves 6 – 7 mm.	97

5-11. Uneven seams (9) …… Sticking in needle plate

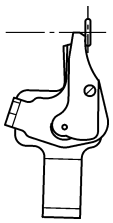
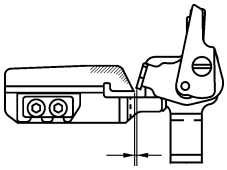
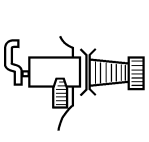
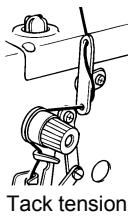
Front and rear tack sections of material gets stuck in needle hole

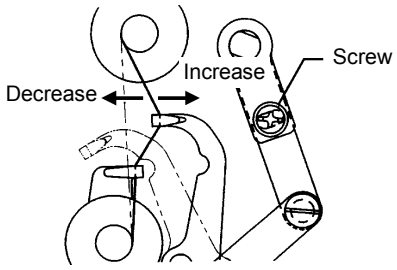
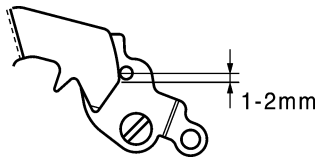
Cause	Check	Remedy	Page
Start backtack	Number of start backtack stitches	Use parameter number 40 to reduce the number of stitches in the front tack. * If the material is soft, it can be effective to set the number of stitches to 0.	Instruction manual
Rear tack	Rear tack vector shape	Use parameter number 37 to set the rear tack vector shape to a rectangle. * Setting the vector shape to a rectangle can be effective when the width is less than the bar tack width.	Instruction manual
Needle plate	Needle plate	· When using knit material, replace with the –3 needle plate. · Replace with a needle plate with a smaller needle hole.	-

5-12. Uneven seams (10) …… All stitches

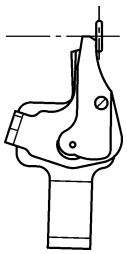
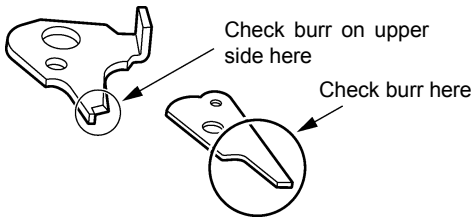
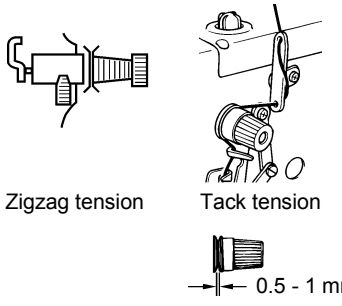
Cause	Check	Remedy	Page
Threading	Upper thread threading	Thread the upper thread correctly.	Instruction manual
	Lower thread threading	Thread the lower thread correctly.	Instruction manual
Thread path	Flaw or abrasion on the thread path	Polish with buff or replace the part. Especially, pay attention to finishing around needle plate hole.  3996Q	-
Needle	Needle installation	Insert needle fully into needle bar	Instruction manual
	Needle size	Replace needle with thicker one.	-
Thread chips or dust	Rotary hook rim Rotary hook edge Around needle plate hole	Remove thread chips or dust	-
Upper thread	Upper thread tension	Increase upper thread tension while checking stitches.	Instruction manual
	Thread and needle	Replace needle with one that fits for the thread.	-
Rotary hook holder	Flaw on the rotary hook holder	Polish with buff or replace the part.  3997Q	85
	Rotary hook holder and inner rotary hook overlap amount	Adjust the rotary hook holder and inner rotary hook overlap amount.	85
Rotary hook	Rotary hook lubrication	Decrease the quantity of lubrication oil. * Note that if you reduce the amount of oil too much, thread breakages may occur.	102
Bobbin winder guide	Bobbin thread tension	Adjust the tension on the bobbin winder guide.	-
	Uneven bobbin winding	Move bobbin winder tension bracket up and down to adjust.	Instruction manual
Lower thread	Lower thread tension	Adjust the lower thread tension.	Instruction manual
Bobbin case	Damaged outside of bobbin case and bent bobbin holder spring, etc.	Polish with buff or replace the part. * Use the HE-800A bobbin case.	-
Stitch patterns	Purl stitch, whip stitch	Set using parameter number 11.	Instruction manual

5-13. Upper thread run out

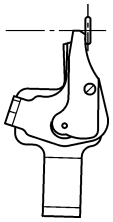
Cause	Check	Remedy	Page
Upper thread trimmer assembly	Installation position of upper thread trimmer assembly	Adjust the installation position of upper thread trimmer assembly by moving the setting plate assembly. · Upper thread trimmer longitudinal position adjustment · Upper thread trimmer cutting depth adjustment  4005Q	91, 92
	Upper thread trimmer assembly holding force	Adjust so that the thread does not come out when you cut it with scissors and hold the end of the thread between your fingers and gently swing the assembly. · Bend the scissors U or replace them so that the correct force is applied. · Repair any damage from striking the needle. Cotton yarn #60 Holding force approx. 2N 4006Q	-
	Opening cam position	Adjust the position so that the scissors do not touch the opening cam when the work clamp is lowered.  0.5 mm 4007Q	94
Tension release timing	End of tension release at the beginning of sewing	Use parameter number 63 to retard the tension release timing.	Instruction manual
	Opening amount of zigzag tension discs and bar tack tension discs	· Adjust the zigzag tension discs by moving the tension stud bracket in and out. · Adjust the bar tack tension discs opening amount to 0.5 - 1.0 mm by removing the top cover and moving the tension release cam.  Zigzag tension  Tack tension 0.5 - 1 mm 4008Q	100

Cause	Check	Remedy	Page
Upper thread feeding	Thread take-up amount	Loosen the screw to decrease thread take-up amount so that upper thread does not pull out of scissors assembly at the sewing start.  4000Q	101
Rotary hook	Needle bar height and needle bar lift amount	Adjust the needle and hook timing. 1. Adjust the needle bar height to “1” on the gauge. 2. Adjust the needle bar lift amount to “2” on the gauge.	83
	Thread chips on rotary hook edge	Remove thread chips.	-
Machine stopping position	Upper shaft pulley stopping position	Adjust the needle up sensor position.	103
Lower thread	Lower thread retaining amount	Adjust the lower thread retaining amount.  4003Q	96
	Lower thread snapping	· Use memory switch No. 02 to retard the work clamp lifting speed. · Process the lower thread retainer, lower thread clamp and lower thread presser plate so that they do not snap the lower thread.	Instruction manual
	Lower thread clamp opening timing	Adjust so that the lower thread clamp plate opens when the feed mechanism moves 6 – 7 mm.	97
Sewing start speed	Slow speed	Use parameter number 60 to reduce the slow speed.	Instruction manual
	Slow start stitches	Use parameter number 59 to increase the number of slow start stitches.	Instruction manual
Bar tack thread tension	Bar tack thread tension is too strong.	Make the bar tack tension as weak as possible.	100
Upper thread breakage	Upper thread breaks.	Refer to “5-1. Upper thread breakage”.	104, 105

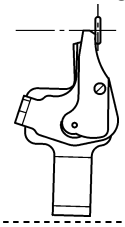
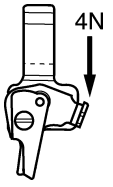
5-14. Unraveling of thread trimmed by upper thread trimmer assembly

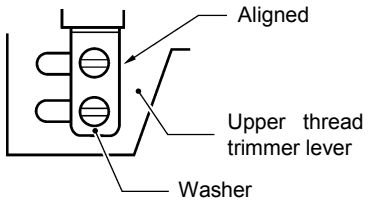
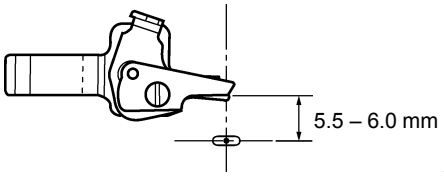
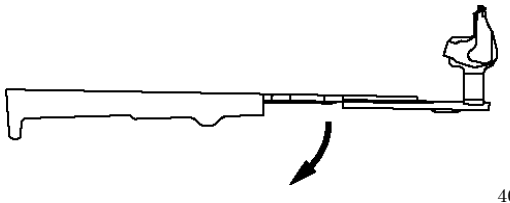
Cause	Check	Remedy	Page
Upper thread trimmer assembly	Installation position of upper thread trimmer assembly	Adjust the installation position of upper thread trimmer assembly by moving the setting plate assembly. · Upper thread trimmer longitudinal position adjustment · Upper thread trimmer cutting depth adjustment  4005Q	91, 92
	Burr on tips of upper thread trimmer M and upper thread trimmer U.	Polish with buff or replace the part.  4009Q	-
Tension release timing	Opening amount of zigzag tension discs and bar tack tension discs (particularly zigzag tension discs)	· Adjust the zigzag tension discs by moving the tension stud bracket in and out. · Adjust the bar tack tension discs opening amount to 0.5 - 1.0 mm by removing the top cover and moving the tension release cam.  4008Q	100
Work clamp	Work clamp lifting speed	Use memory switch No. 02 to retard the work clamp lifting speed.	Instruction manual

5-15. Upper thread mis-trimming

Cause	Check	Remedy	Page
Upper thread trimmer assembly	Installation position of upper thread trimmer assembly	Adjust the installation position of upper thread trimmer assembly by moving the setting plate assembly. · Upper thread trimmer longitudinal position adjustment · Upper thread trimmer cutting depth adjustment  4005Q	91, 92
	Upper thread trimmer assembly holding force	Adjust so that the thread does not come out when you cut it with scissors and hold the end of the thread between your fingers and gently swing the assembly. · Bend the scissors U or replace them so that the correct force is applied. · Repair any damage from striking the needle. 4006Q	-
Trimmer driving arm	Upper thread trimmer cutting depth	Adjust the position of the trimmer driving arm roller.	92

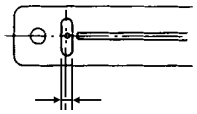
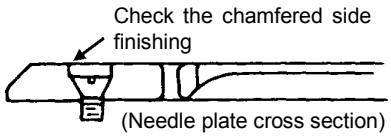
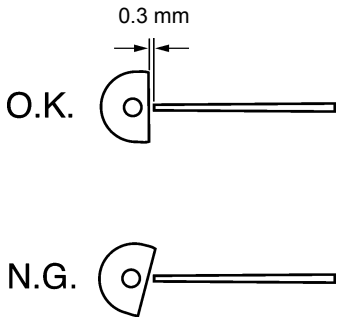
5-16. Needle strikes upper thread trimmer

Cause	Check	Remedy	Page
Upper thread trimmer assembly	Installation position of upper thread trimmer assembly	Adjust the installation position of upper thread trimmer assembly by moving the setting plate assembly. · Upper thread trimmer longitudinal position adjustment · Upper thread trimmer cutting depth adjustment  4005Q	91, 92
	upper thread trimmer operating force	Remove any scratches and burrs, and adjust the upper thread trimmer M to open when the projection is pressed with a force of 4N or less.  4010Q	-

Cause	Check	Remedy	Page
Longitudinal feed arm	Installation position of the longitudinal feed arm	Move the upper thread trimmer driving link so that it stops at the face plate. In this position, tighten the bolts so that the small slot in the upper thread trimmer lever and the edge of the washer are aligned.  4011Q	90
Needle bar height in machine stopped condition	Upper shaft pulley stopping position	Adjust the needle up sensor position.	103
Cam	Upper thread scissors opening timing	Adjust so that the cam opens the stop plate properly.	95
Opening cam	Upper thread scissors gradual opening timing	Adjust the timing so that the upper thread scissors gradually start opening when the feed mechanism moves about 1.5 - 2.5 mm.	94
	Upper thread scissors operation	Apply grease to the inclined face of the opening cam.	94
Work clamp home position sensor	Work clamp home position sensor position	After setting the sewing machine to the home position, press the RESET key and then adjust the distance between the upper thread trimmer and the center of the needle when the work clamp is lowered to 5.5 - 6.0 mm.  4012Q	82, 95
Upper thread trimmer lever	Upper thread trimmer lever operating force	Adjust so that the upper thread trimmer lever opens gently when the stop plate is separated from the stopper.  4013Q	-

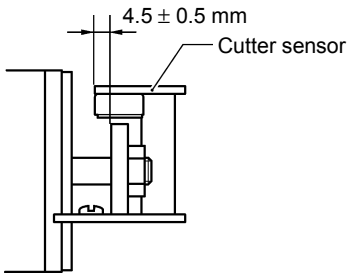
5-17. Needle breakage

Cause	Check	Remedy	Page
Needle	Needle installation	As viewed from the direction of the face plate, insert needle fully into needle bar so that the notched part of needle faces frontward.	Instruction manual
Rotary hook	Needle bar height and needle bar lift amount	Adjust the needle and hook timing. 1. Adjust the needle bar height to “1” on the gauge. 2. Adjust the needle bar lift amount to “2” on the gauge.	83
	Gap between needle and rotary hook	Adjust the gap between needle and rotary hook to 0.01 - 0.08 mm. (Adjust to as large as possible without causing skipped stitches to occur.) * Check that rotary hook point does not strike needle in zigzag motion.	84

Cause	Check	Remedy	Page
Needle plate	Needle plate position	Adjust the forward/back position of the needle plate so that the needle is in the center of the needle hole.  4014Q	-
	Burr on the screw hole edge (in event of uneven material feeding)	Polish with buff.  4015Q	-
Upper thread trimmer assembly	Needle strikes upper thread trimmer	Refer to “5-16. Needle strikes upper thread trimmer”.	114, 115
Cutter	Clearance between needle bar and cutter	Install the cutter so that the clearance between the needle bar and the cutter is 0.3 mm. * The cutter release section of the needle bar should be at a right angle to the cutter.  4016Q	83

5-18. Imperfect cutter function (imperfect material cutting)

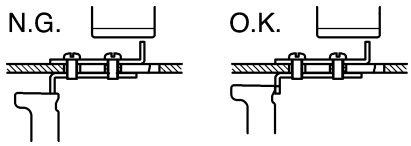
Cause	Check	Remedy	Page
Cutter	Installation position of cutter	Install the cutter so that its edge is aligned with the top of the needle plate.	88
	Cutter blade	· If blade is worn or chipped, sharpen it or replace it. · Replace with the special needle plate (optional).	Instruction manual
	Damage to cutter mechanism parts Loose screws	· Replace any parts that are damaged. · Tighten any loose screws.	-
Cutter solenoid	Check for a disconnected cord.	Connect the cords.	-
Cutter power	Memory switches	If the material is heavy and difficult to cut, use memory switch No. 00 to increase the cutting force of the cutter.	Instruction manual

Cause	Check	Remedy	Page
Solenoid stopper	Nut	Check if the nut is loose, and tighten it securely.	-
	Cutter sensor position	· Adjust the cutter sensor position. · Check if the mounting screws are loose, and tighten them securely.  4017Q	86
Cutter bar guide	Smoothness of cutter operation	Adjust the cutter bar guide so that the cutter operates smoothly with no play.	61

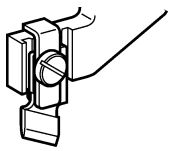
5-19. Cutter does not return

Cause	Check	Remedy	Page
Cutter	Cutter blade	If blade is worn or chipped, sharpen it or replace it.	-
Sticks in material	Needle plate	Replace with the special needle plate (optional).	Instruction manual
Cutter bar guide	Smoothness of cutter operation	Adjust the cutter bar guide so that the cutter operates smoothly with no play.	61

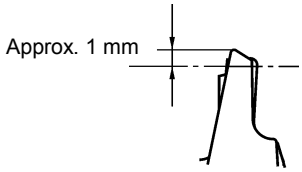
5-20. Cutter and upper thread scissors touch

Cause	Check	Remedy	Page
Upper thread scissors	Check if the cam opens the stop plate.	Adjust the cam position. * If the feed mechanism operates when the cam has not opened the stop plate, the cutter will bump against the upper thread scissors.  4018Q	95

5-21. Seam is cut

Cause	Check	Remedy	Page
Length of knife setting	Length of knife	Set parameter number 02 to the same value as the length of the knife being used.	Instruction manual
Knife space setting	Cutting of zigzag seam	· Use parameter number 06 to set the knife X space. · Use parameter number 08 to set the knife X position alignment.	Instruction manual
Cutter	Cutter play	Adjust the cutter bar guide so that the cutter operates smoothly with no play.	61
	Cutter knife bending	Use the cutter holder (option) to prevent the cutter knife from becoming bent.  4019Q	88

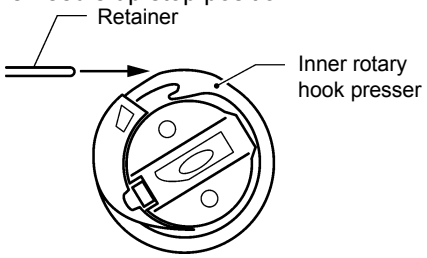
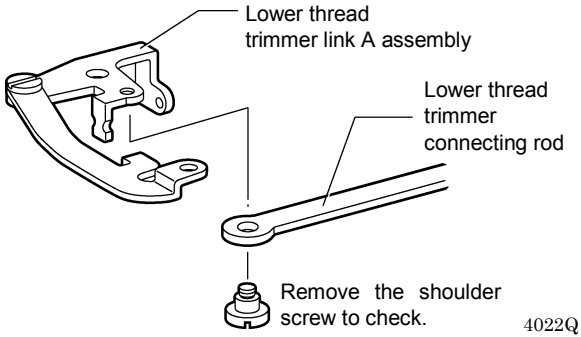
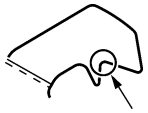
5-22. Upper thread mis-winding

Cause	Check	Remedy	Page
Upper thread scissors	Installation height	Adjust the upper thread scissors installation height.	93
	Upper thread scissors gradual opening timing	Adjust the timing so that the upper thread scissors gradually start opening when the feed mechanism moves about 1.5 - 2.5 mm.	94
	Upper thread scissors opening timing	Adjust so that the cam opens the stop plate properly.	95
	Upper thread trimmer assembly movement	· Polish blade of upper thread trimmer M and upper thread guide with buffer. · Check for burrs on the top surface of upper thread trimmer M. · Replace the parts.	-
	Lateral position of upper thread scissors	Adjust the lateral position of the upper thread scissors.  4020Q	91
Stitch quality	Upper thread tension	Decrease tension to such a degree that it does not influence stitch quality.	Instruction manual
	Zigzag width in the zigzag stitch portion	Use parameter number 05 to increase the zigzag width to such a degree that it does not influence the seam shape.	Instruction manual
Work clamp	Uneven material feeding	· Increase work clamp pressure. (Press material so that the material is properly stretched.) · When using knits or woven materials, replace the parts with the –3 specification parts: Length feed plate (for specification -3), work clamp assembly (for knits), needle plate 1.2 (for specification -3)	85
Underlay	Underlay is being sewn.	· Use parameter number 52 to reduce the underlay sewing start pitch to about 0.5. · Use parameter number 48 to reduce the underlay sewing speed. * If sewing knitted wear, the upper thread may get caught easily, so you may need to process the end of the thread.	Instruction manual
Bar tack	Straight bar tacking is being carried out	When carrying out straight bar tacking, the upper thread may get caught easily, so you may need to process the end of the thread.	-

5-23. Work clamp is not raised (1) Pulse motor stepping sound cannot be heard

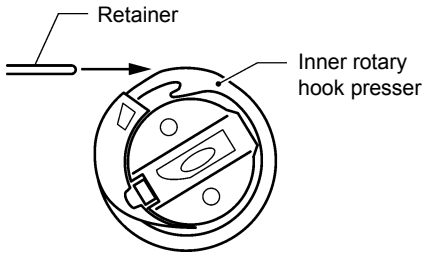
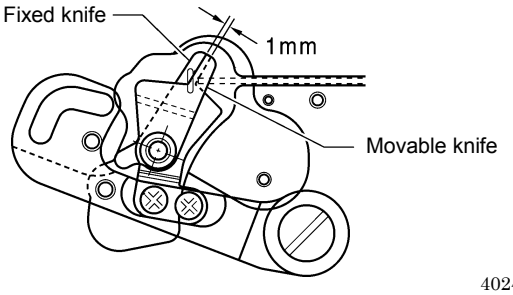
Cause	Check	Remedy	Page
Work clamp lifting height setting	Check the work clamp lifting height setting.	Change the settings of memory switch Nos. 04, 05, 06.	Instruction manual
Treadle	Does the work clamp rise when the treadle is depressed backward?	If it rises, use memory switch No. 08 to adjust the threshold value for lowering the work clamp to a positive value.	Instruction manual
Presser lifter pulse motor	Cord connection	Check the cord connections and contacts.	-
	Presser lifter pulse motor driving gear	Check if the drive gear screw is loose.	-

5-24. Work clamp is not raised (2) Pulse motor stepping sound can be heard

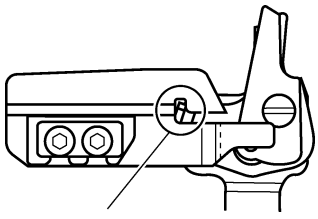
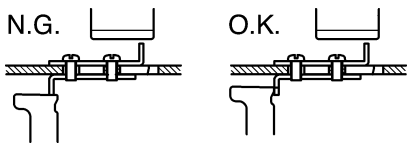
Cause	Check	Remedy	Page
Machine stopping position	Rotary hook touches lower thread retainer at the stop position	Adjust the needle up stop position.  4021Q	103
Work clamp lifting speed is too fast.	Work clamp lifting speed setting	Use memory switch No. 02 to retard the work clamp lifting speed.	Instruction manual
Upper thread scissors	Interference between upper thread scissors and work clamp	Check the standard adjustments with the upper thread scissors removed. * Be particularly careful when sewing joints.	93
	Upper thread scissors operation	Apply grease to the inclined face of the opening cam.	94
Lower thread trimmer	Interference between fixed knife set, lower thread clamp, lower thread presser and lower thread retainer.	Repair or replace the parts.  4022Q	-
	Rubbish, dust or thread scraps present	Remove all rubbish, dust and thread scraps from the lower thread trimmer.	-
Loose screws	Check for loose screws in the upper thread trimmer, lower thread trimmer and work clamp lifter mechanisms.	Securely tighten all screws.	-
Work clamp lifting height setting	Check the work clamp lifting height setting.	Change the settings of memory switch Nos. 04, 05, 06. * If the work clamp lifting height is too high, the lower thread trimming operation will not be timed together with the work clamp rising and the pulse motor may go out of step.	Instruction manual
Threading	Lower thread threading	Insert the bobbin correctly and pass the lower thread through the bobbin case correctly. * If the bobbin is inserted back-to-front, it will spin loosely and the presser lifter may go out of step.	Instruction manual
	Lower thread tension	Reduce the lower thread tension. * If the lower thread tension is too strong, the motor may go out of step. Use memory switch No. 02 to reduce the work clamp lifting speed setting to make the lifting speed slower.  Buff this section to reduce the thread retaining resistance. 4023Q	Instruction manual

Cause	Check	Remedy	Page
Upper thread scissors	Upper thread scissors operation	Adjust the upper thread scissors to the standard setting.	89
Work clamp home position sensor	Work clamp home position sensor position	Adjust the work clamp home position sensor position.	82

5-25. Lower thread is not trimmed (pulls when material is removed)

Cause	Check	Remedy	Page
Machine stopping position	Rotary hook touches lower thread retainer at the stop position	Adjust the needle up stop position.  4021Q	103
Fixed knife set	Fixed knife and movable knife do not mesh.	Adjust the fixed knife set installation position.  4024Q	96
	Knife tip is bent or chipped.	Repair or replace the knife.	-

5-26. Feed mechanism does not operate or motor is out of step

Cause	Check	Remedy	Page
Feed pulse motor	Cord connection	Check the cord connections and contacts.	-
Upper thread scissors	Upper thread scissors position	Remove and re-install the upper thread scissors.  Projection on scissors M is inserted. * Always make sure that the upper thread scissors are in the correct position before use. 4025Q	91
	Check if the cam opens the stop plate.	Adjust the cam position. * If the feed mechanism operates when the cam has not opened the stop plate, the cutter will bump against the upper thread scissors.  4018Q	95

Cause	Check	Remedy	Page
Feed home position sensor	Feed home position sensor position	Adjust the feed home position sensor position.	81
Feed timing belt	Feed timing belt tension	Adjust the feed timing belt.	101

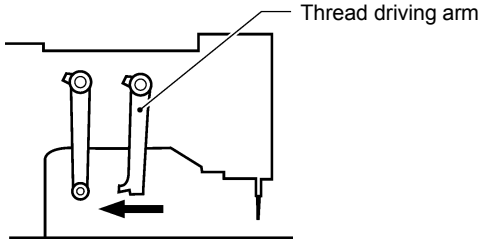
5-27. Needle does not zigzag or noise occurs when needle zigzags

Cause	Check	Remedy	Page
Zigzag home position sensor	Zigzag home position sensor position	Adjust the zigzag home position sensor position.	80
Stopper	Stopper position	Adjust the stopper position.	80

5-28. Sewing machine stops during sewing

Cause	Check	Remedy	Page
Thread breakage detector	Thread breakage detector position	Adjust the thread breakage detector position. * If the detector is not adjusted, sewing may stop even when the thread is not broken.	99
Pauses	Panel DIP switch A - No. 3	When panel DIP switch A - No. 3 is set to ON, sewing will pause when the treadle is depressed backward. * If the treadle is depressed very firmly and then released, the pedal may depress backward and cause sewing to be paused.	Instruction manual
Threading	Upper thread threading	Pass the thread correctly through the thread guide.	Instruction manual
Error [E-07]	Upper thread scissors operation	Apply grease to the inclined face of the opening cam.	94

5-29. Upper shaft does not rotate as far as the needle up stop position

Cause	Check	Remedy	Page
Thread retainer and rotary hook are touching.	Thread trimmer mechanism position	· Turn the machine pulley backward to set the needle bar to the needle up position. · Push the thread driving arm in the direction of the arrow to set the thread trimming mechanism to the home position.  4026Q	-

6. ELECTRIC COMPONENTS AND SOFTWARE

⚠ DANGER

Wait at least 5 minutes after turning off the power switch and disconnecting the power cord from the wall outlet before opening the face plate of the control box. Touching areas where high voltages are present can result in severe injury.

6-1. Precautions at the time of adjustment

Pay attention to the following when opening the control box for maintenance.

Electric shock

Some large capacitors may have a high voltage remaining in them for up to 5 minutes after the power is turned off. To prevent electric shock, wait at least 5 minutes after the power is turned off before doing the following:

- Opening and closing the control box
- Replacing fuses
- Separating and joining connectors
- Measuring resistance
- Doing anything with a possibility of touching something inside the control box

Some adjustments require measuring the voltage while the power is turned on with the control box kept open. In such a case, be careful not to touch any place other than that for the measurement. In addition, always keep in mind that a high voltage remains for about 5 minutes after power is turned off.

Injury

While the power is turned on, the cooling fan of the control box operates; be careful not to get caught in it. When separating or rejoining connectors, and measuring something, be careful not to cut your fingers on metal parts such as heat sinks and covers.

6-2. Components inside the control box and the operation panel

The following are brief explanations of components inside the control box. See control circuit block diagram at the end of this manual for the details of the connections.

Main circuit board
This circuit board is secured to the front cover (main PCB setting plate), and it control the pulse motors and solenoids.

Sub circuit board
This circuit board is secured to the rear cover (sub PCB setting plate), and it drives the work clamp, feed pulse motor and cutter solenoid.

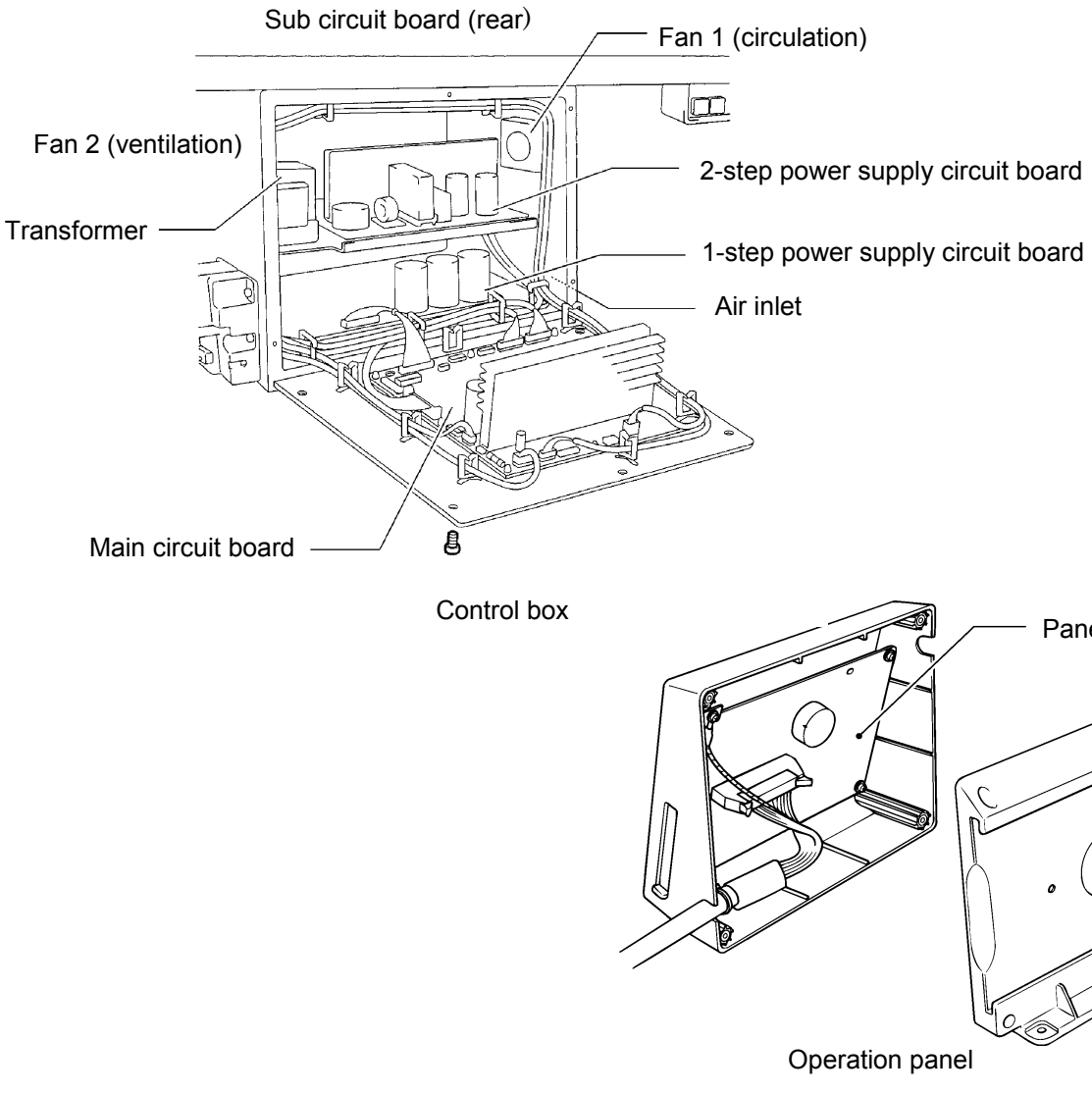
1-step power supply circuit board, 2-step power supply circuit board
These are secured to the bases of the first and second levels of the control box, and they generate the voltages which are necessary for the various control operations.

Panel PCB
The panel PCB is fixed to the front panel of the operation panel. This PCB controls indications of the machine status and the input operation.

DC fan motor
The DC fan motor serves as a fan to cool the inside of the control box. Clean the inlet filter monthly.

Transformer
This is secured to the base of the second level of the control box, and it generate the voltages which are necessary for the various control operations.

4368Q



3584Q

6-3. Fuse explanation

When replacing a fuse, be sure to use the specified ones listed below.
If a component on a PCB is damaged, a fuse may blow again immediately even when it has been replaced.
* F2 may also blow as a result of a malfunction of the peripheral electronic component FET.

[Main circuit board]

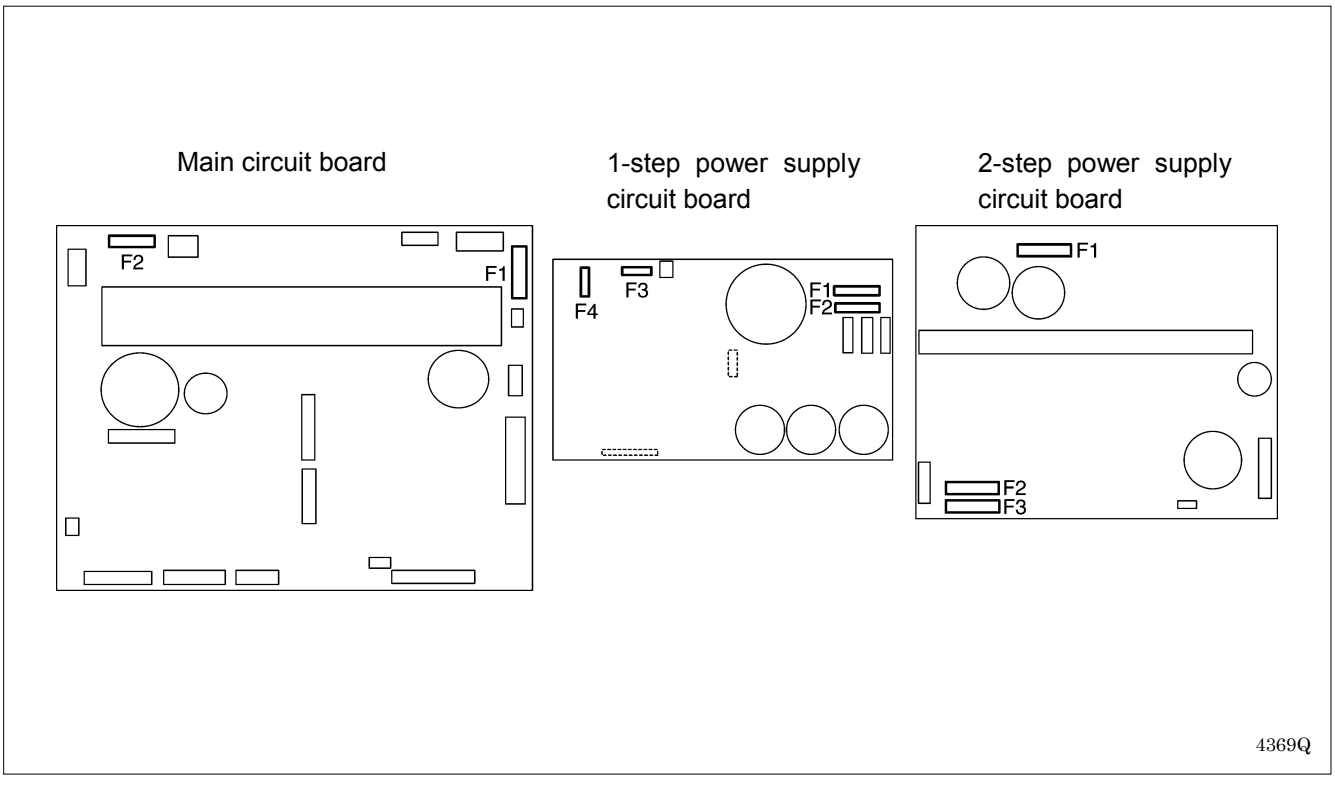
No.	Part name	Part code	When a fuse has blown	Voltage
F1	GFUSE8A (glass tube fuse, 8A-250V)	S47680-000	The tension release solenoid does not operate.	+40V
F2	GFUSE8A250VFB (glass tube fuse, 8A-250V (FB))	S47717-000	The zigzag motor does not operate.	DC300V

[1-step power supply circuit board]

No.	Part name	Part code	When a fuse has blown	Voltage
F1 F2	Fuse 15A#2 (glass tube fuse, 15A-250V)	218469-001	The zigzag motor does not operate. The tension release solenoid does not operate. The operation panel does not operate. The control box fan does not operate.	AC200V
F3 F4	Fuse 2A250V (glass tube fuse, 2A-250V)	J02727-001	The feed motor and presser foot motor do not operate. The cutter solenoid does not operate. The operation panel does not operate.	DC300V

[2-step power supply circuit board]

No.	Part name	Part code	When a fuse has blown	Voltage
F1	G fuse 5AFB (quick melting type, 5A-250V)	S08030-000	The feed motor and presser foot motor do not operate. The cutter solenoid does not operate.	+55V
F2 F3	Fuse 6A (glass tube fuse, 6A-250V)	153242-000		AC200V

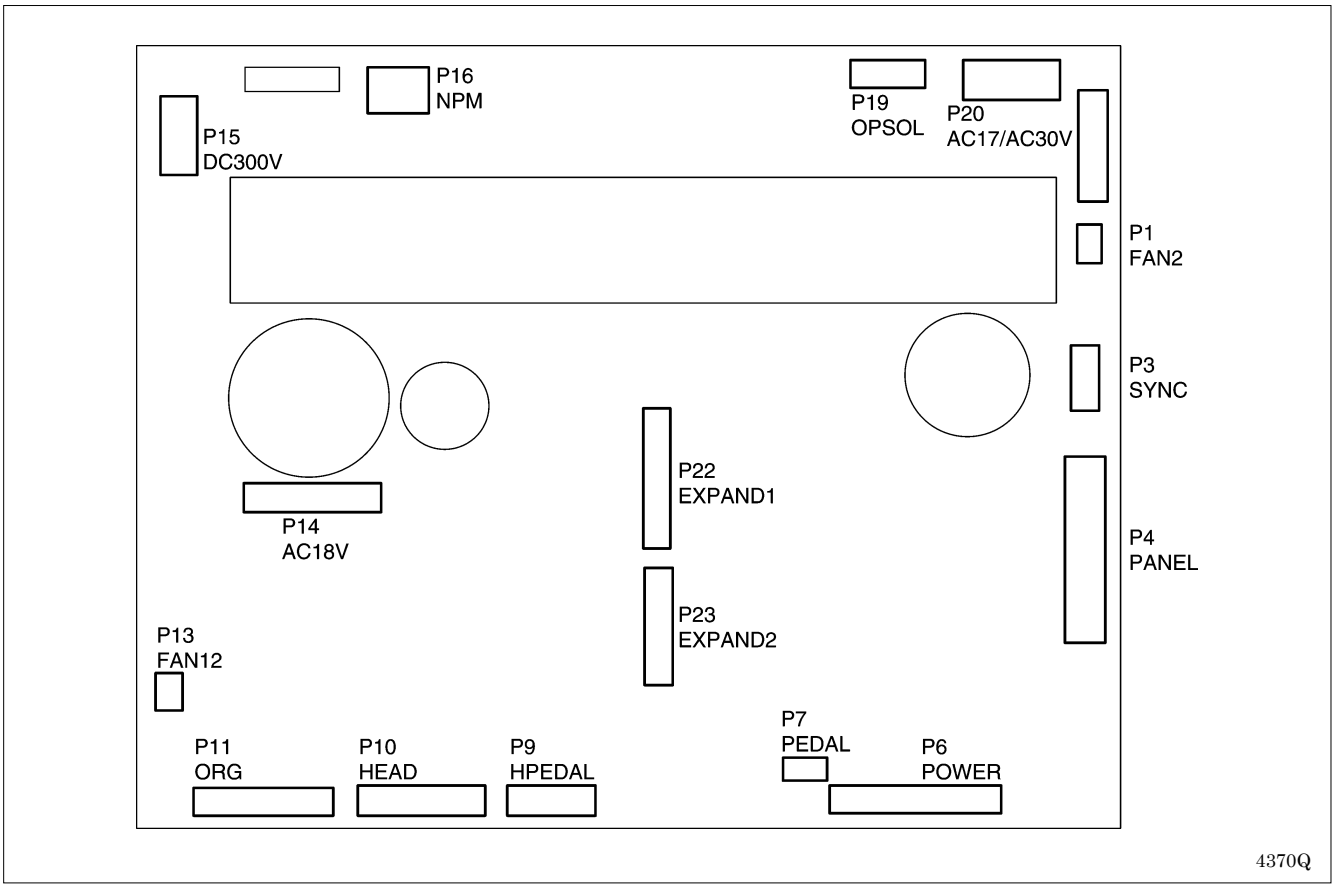


6-4. Connectors

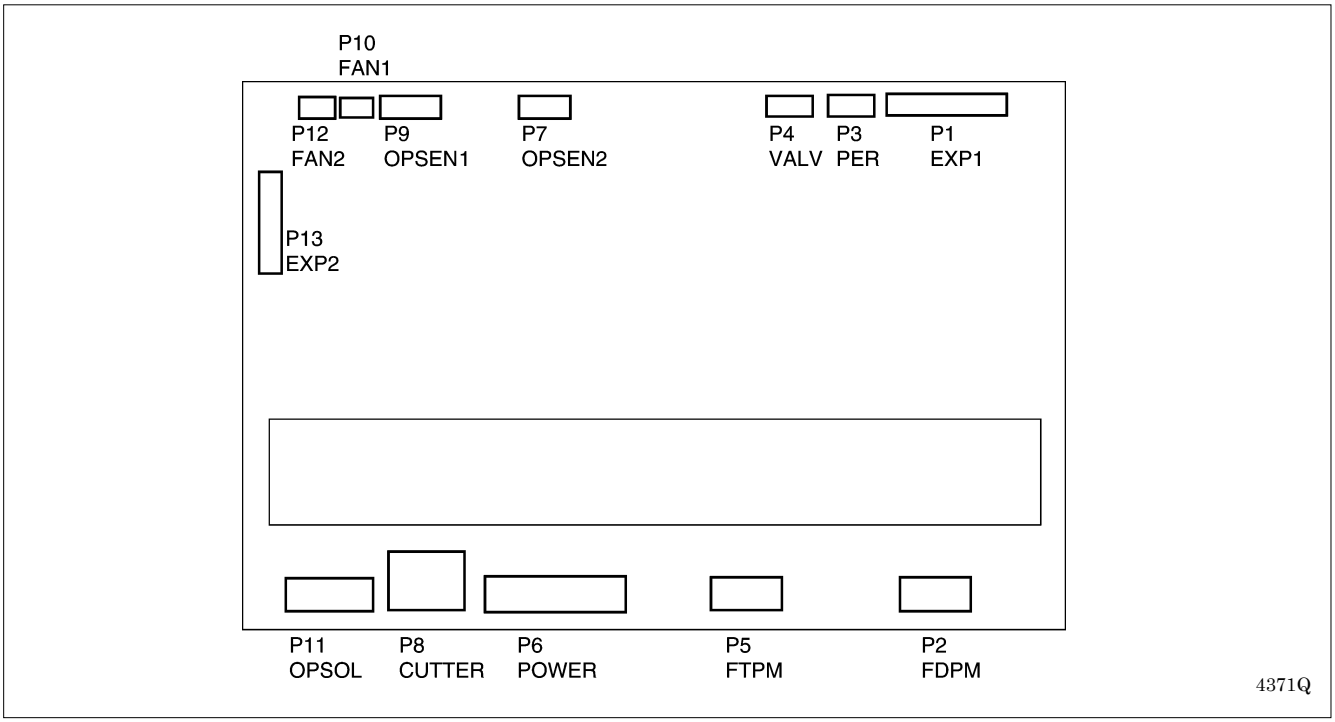
Most of the machine trouble is due to connector problems including improper connection or sufficient contact. Therefore, be sure to check if each connector is correctly inserted and that there is no contact failure between pins and wires before starting troubleshooting procedures.

6-4-1. Connector positions

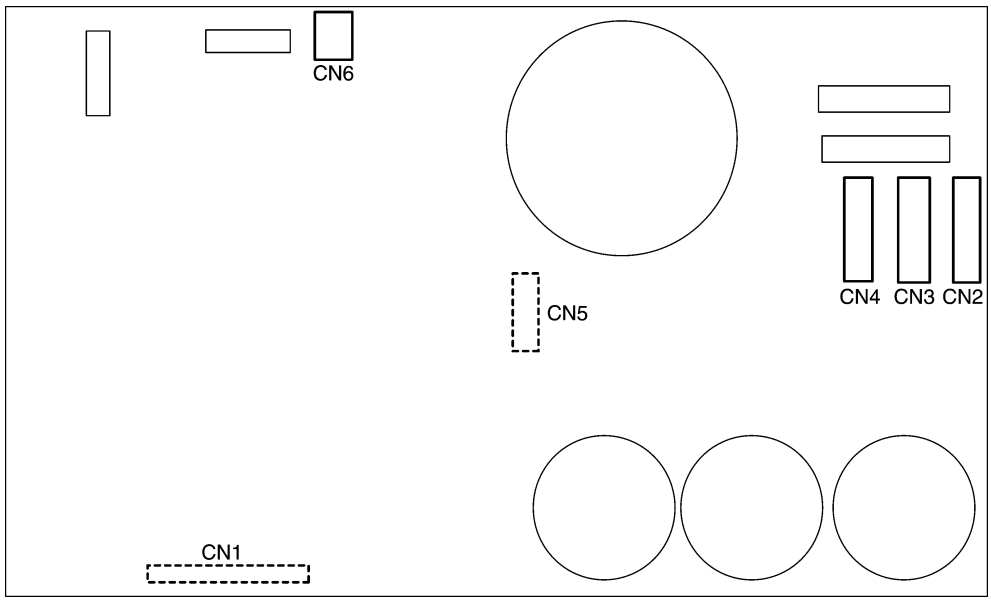
Main circuit board



Sub circuit board

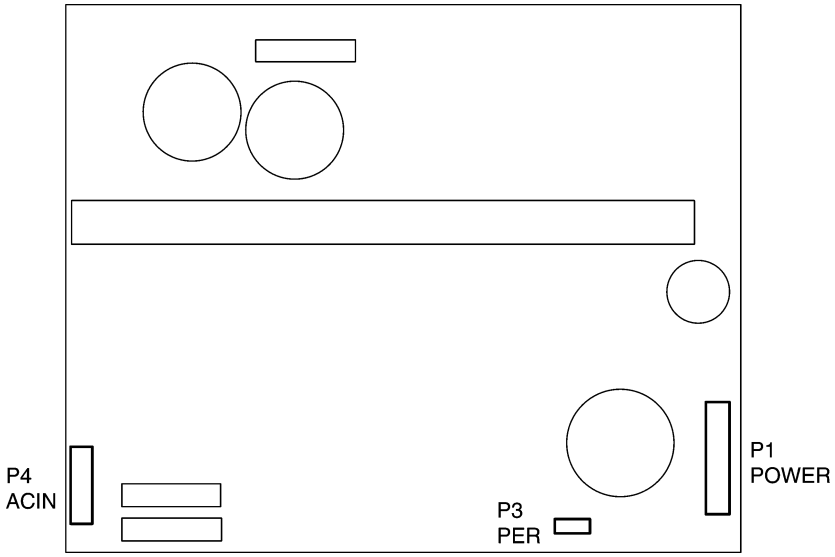


1-step power supply circuit board



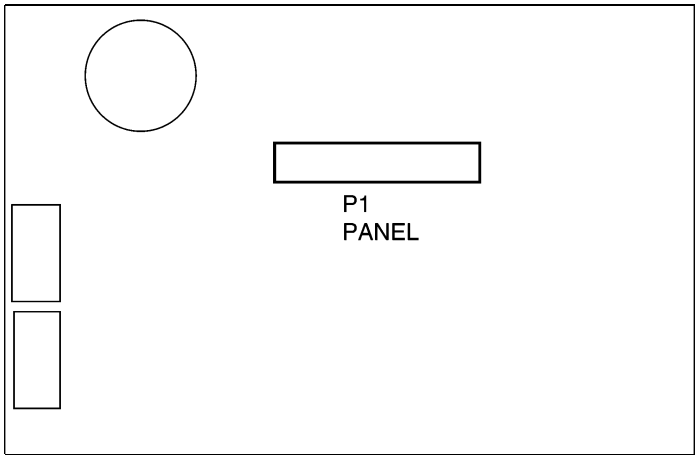
4372Q

2-step power supply circuit board



4373Q

Panel PCB



4374Q

6-4-2. Signal names for connectors and probable symptoms due to poor contact

1. Circuit board connectors [Main circuit board]

P1 [FAN2]

Pin no.	Signal name	Probable symptoms due to poor contact
1	+24V	• The inside air circulation fan does not operate. • Error E-41 is displayed.
2	FAN2 signal	
3	0V	

P3 [SYNC]

Pin no.	Signal name	Probable symptoms due to poor contact
1	+5V	• The machine motor does not turn. • A machine stopping error occurs. • One of error E-02, E-62, E-63 and E-64 is displayed.
2	Encoder signal	
3	Needle up stop position signal	
4	Needle down stop position signal	
5	0V	

P4 [PANEL]

Pin no.	Signal name	Probable symptoms due to poor contact
1	+5V	• The operation panel does not operate.
2	0V	
3	KEY0	
4	KEY1	
5	KEY2	
6	OC	
7	A	
8	B	
9	C	
10	D	
11	E	
12	F	
13	G	
14	STB	
15	P8V	
16	SENSOR	
17	BUZZER	
18	0V	
19	0V	
20	0V	

P6 [POWER]

Pin no.	Signal name	Probable symptoms due to poor contact
1	P8V (+8V)	• The power indicator of operation panel does not illuminate. • The machine motor does not turn.
2	0V	
3	N8V (-8V)	
4	OV. det	
5	RY. out	
6	OV. FAULT	
7	+5V	
8	PHOTO	
9	U	
10	V	
11	W	
12	U	
13	V	
14	W	
15	IPM. FAULT	

P7 [PEDAL]

Pin no.	Signal name	Probable symptoms due to poor contact
1	P8V (+8V)	• The home position can not be found. • Work clamp does not operate. • The machine does not operate. • One of error E-30, E-31 and E-32 is displayed.
2	PEDAL signal	
3	0V	
4	N8V (-8V)	

P9 [HPEDAL] Standing operation pedal (option)

Pin no.	Signal name	Probable symptoms due to poor contact
1	P8V (+8V)	• The home position can not be found. • Work clamp does not operate. • The machine does not operate. • One of error E-30, E-31 and E-32 is displayed.
2	Work clamp (FORSW) signal	
3	Backward (BAKSW) signal	
4	0V	
5	Spare (INCHSW) signal	
6	Start (PRSW) signal	
7	Spare (HPEDAL) signal	

P10 [HEAD]

Pin no.	Signal name	Probable symptoms due to poor contact
1	Stop NC signal	• The stop switch is not activated. • The thread breakage detection does not operate normally.
2	0V	
3	Stop NO signal	
4	+24V	
5	-	
6	0V	
7	+5V	
8	Thread breakage detection signal	
9	-	
10	P8V (+8V)	
11	0V	

P11 [ORG]

Pin no.	Signal name	Probable symptoms due to poor contact
1	+24V	• The home position can not be found. • One of error E-05, E-06 and E-07 is displayed.
2	Zigzag home position signal	
3	0V	
4	+5V	
5	+24V	
6	Feed home position signal	
7	0V	
8	+5V	
9	+24V	
10	Work clamp home position signal	
11	0V	
12	+5V	

P13 [FAN12]

Pin no.	Signal name	Probable symptoms due to poor contact
1	+24V	• The exhaust fan does not operate. • Error E-42 is displayed.
2	FAN1 signal	
3	0V	

P14 [AC18V]

Pin no.	Signal name	Probable symptoms due to poor contact
1	AC18V (+D10V) input	• The zigzag home position can not be found. • The zigzag mechanism does not operate. • Error E-05 is displayed.
2	AC18V (+D10V) input	
3	-	
4	-	
5	AC18V (N) input	
6	AC18V (N) input	
7	-	
8	-	
9	AC18V (A) input	
10	AC18V (A) input	
11	-	
12	-	
13	AC18V (B) input	
14	AC18V (B) input	
15	-	
16	-	
17	AC18V (C) input	
18	AC18V (C) input	
19	-	
20	-	
21	AC18V (D) input	
22	AC18V (D) input	
23	-	
24	-	
25	AC18V (E) input	
26	AC18V (E) input	
27	-	
28	-	
29	AC18V (F) input	
30	AC18V (F) input	

P15 [DC300V]

Pin no.	Signal name	Probable symptoms due to poor contact
1	DC300V	• The zigzag home position can not be found. • The zigzag mechanism does not operate. • Error E-05 is displayed.
2	DC0V	

P16 [NPM]

Pin no.	Signal name	Probable symptoms due to poor contact
1	Zigzag PM driving current A	• The zigzag home position can not be found. • The zigzag mechanism does not operate. • Error E-05 is displayed.
2	Zigzag PM driving current B	
3	Zigzag PM driving current C	
4	Zigzag PM driving current D	
5	Zigzag PM driving current F	
6	-	

P19 [OPSOL]

Pin no.	Signal name	Probable symptoms due to poor contact
1	Spare solenoid	• The tension release solenoid does not operate.
2	-	
3	Tension release solenoid	
4	-	
5	+40V	
6	+40V	

P20 [AC17/AC30V]

Pin no.	Signal name	Probable symptoms due to poor contact
1	AC30V input	• The tension release solenoid does not operate. • The control box fan does not operate. • One of error E-41 and E-42 is displayed.
2	AC30V input	
3	-	
4	AC17V input	
5	AC17V input	

P22 [EXPAND1]

Pin no.	Signal name	Probable symptoms due to poor contact
1	+5V	• The feed home position and work clamp home position can not be found. • The feed mechanism and work clamp mechanism do not operate. • One of error E-06 and E-07 is displayed. • +55 V (power supply for driving the feed mechanism and work clamp PM) control is not possible. • Error E-44 is displayed. • The valve does not operate.
2	+5V	
3	+5V	
4	+5V	
5	+24V	
6	+24V	
7	+24V	
8	+24V	
9	Feed PM clock	
10	Work clamp PM clock	
11	-	
12	-	
13	Work clamp PM direction signal	
14	Feed PM direction signal	
15	Work clamp PM current control signal	
16	Feed PM current control signal	
17	PM current OFF signal	

Pin no.	Signal name	Probable symptoms due to poor contact
18	-	• The feed home position and work clamp home position can not be found. • The feed mechanism and work clamp mechanism do not operate. • One of error E-06 and E-07 is displayed. • +55 V (power supply for driving the feed mechanism and work clamp PM) control is not possible. • Error E-44 is displayed. • The valve does not operate.
19	-	
20	-	
21	VALV1	
22	VALV2	
23	VALV3	
24	VALV4	
25	VALV5	
26	VALV6	
27	+55V OFF signal	
28	+55V relay output signal	
29	0V	
30	0V	
31	0V	
32	0V	

P23 [EXPAND2]

Pin no.	Signal name	Probable symptoms due to poor contact
1	Input signal spare 1	• The feed home position and work clamp home position can not be found. • The feed mechanism and work clamp mechanism do not operate. • One of error E-06 and E-07 is displayed. • Cutter does not operate. • Error E-08 is displayed.
2	Input signal spare 2	
3	Input signal spare 3	
4	Input signal spare 4	
5	Input signal spare 5	
6	Cutter home position sensor signal	
7	Feed PM overcurrent signal	
8	Work clamp PM overcurrent signal	
9	+55V relay input signal	
10	+55V voltage watch signal	
11	-	
12	-	
13	0V	
14	0V	
15	0V	
16	0V	
17	-	
18	-	
19	-	
20	-	
21	Cutter return signal	
22	Cutter signal	
23	Cutter signal	
24	Spare solenoid 1	
25	Spare solenoid 2	
26	Spare solenoid 3	

2. Circuit board connectors [Sub circuit board]

P1 [EXP1]

Pin no.	Signal name	Probable symptoms due to poor contact
1	+5V	• The feed home position and work clamp home position can not be found. • The feed mechanism and work clamp mechanism do not operate. • One of error E-06 and E-07 is displayed. • +55 V (power supply for driving the feed mechanism and work clamp PM) control is not possible. • Error E-44 is displayed. • The valve does not operate.
2	+5V	
3	+5V	
4	+5V	
5	+24V	
6	+24V	
7	+24V	
8	+24V	
9	Feed PM clock	
10	Work clamp PM clock	
11	-	
12	-	
13	Work clamp PM direction signal	
14	Feed PM direction signal	
15	Work clamp PM current control signal	
16	Feed PM current control signal	
17	PM current OFF signal	
18	-	
19	-	
20	-	
21	VALV1	
22	VALV2	
23	VALV3	
24	VALV4	
25	VALV5	
26	VALV6	
27	+55V OFF signal	
28	+55V relay output signal	
29	0V	
30	0V	
31	0V	
32	0V	

P2 [FDPM]

Pin no.	Signal name	Probable symptoms due to poor contact
1	Feed PM driving current A	• The feed home position can not be found. • The feed mechanism does not operate. • Error E-06 is displayed.
2	Feed PM driving current B	
3	Feed PM driving current C	
4	Feed PM driving current D	
5	Feed PM driving current F	

P3 [PER]

Pin no.	Signal name	Probable symptoms due to poor contact
1	Relay input signal	• The feed home position and work clamp home position can not be found. • The feed mechanism and work clamp mechanism do not operate. • One of error E-06 and E-07 is displayed. • +55 V (power supply for driving the feed mechanism and work clamp PM) control is not possible. • Error E-44 is displayed.
2	0V	
3	+55V relay output signal	
4	+55V OFF signal	
5	0V	

P4 [VALV]

Pin no.	Signal name	Probable symptoms due to poor contact
1	VALV1	(Special edition)
2	VALV2	
3	VALV3	
4	VALV4	
5	VALV5	
6	VALV6	
7	-	
8	-	
9	+24V	
10	+24V	

P5 [FTPM]

Pin no.	Signal name	Probable symptoms due to poor contact
1	Work clamp PM driving current A	• The work clamp home position can not be found. • The work clamp mechanism does not operate. • Error E-07 is displayed.
2	Work clamp PM driving current B	
3	Work clamp PM driving current C	
4	Work clamp PM driving current D	
5	Work clamp PM driving current F	

P6 [POWER]

Pin no.	Signal name	Probable symptoms due to poor contact
1	+55V (for PM power supply) DC55V	• The work clamp home position and feed home position can not be found. • The work clamp mechanism and feed mechanism do not operate. • One of error E-06 and E-07 is displayed. • Cutter does not operate. • Error E-08 is displayed.
2	+55V (for PM power supply) DC55V	
3	P0V	
4	P0V	
5	+24V	
6	0V	
7	M55V (for cutter power supply) DC55V	
8	M55V (for cutter power supply) DC55V	
9	MP0V	
10	MP0V	

P7 [OPSEN2]

Pin no.	Signal name	Probable symptoms due to poor contact
1	+24V	• Cutter does not operate. • Error E-08 is displayed.
2	+5V	
3	Input signal spare 4	
4	0V	
5	+24V	
6	+5V	
7	Input signal spare 5	
8	0V	
9	+24V	
10	+5V	
11	Cutter home position sensor signal	
12	0V	

P8 [CUTTER]

Pin no.	Signal name	Probable symptoms due to poor contact
1	Cutter driving current	• Cutter does not operate. • Error E-08 is displayed.
2	-	
3	Cutter return driving current	
4	Cutter driving current	
5	-	
6	Cutter return driving current	

P9 [OPSEN1]

Pin no.	Signal name	Probable symptoms due to poor contact
1	+24V	(Special edition)
2	+5V	
3	Input signal spare 1	
4	0V	
5	+24V	
6	+5V	
7	Input signal spare 2	
8	0V	
9	+24V	
10	+5V	
11	Input signal spare 3	
12	0V	
13	0V	
14	0V	

P10 [FAN1]

Pin no.	Signal name	Probable symptoms due to poor contact
1	+24V	• The feed pulse motor cooling fan does not spin.
2	FAN1 signal	
3	0V	

P11 [OPSOL]

Pin no.	Signal name	Probable symptoms due to poor contact
1	+55V	(Special edition)
2	+55V	
3	+55V	
4	Spare solenoid driving current 7	
5	Spare solenoid driving current 8	
6	Spare solenoid driving current 9	

P12 [FAN2]

Pin no.	Signal name	Probable symptoms due to poor contact
1	+24V	(Special edition)
2	Spare input	
3	0V	

P13 [EXP2]

Pin no.	Signal name	Probable symptoms due to poor contact
1	Input signal spare 1	• The feed home position and work clamp home position can not be found. • The feed mechanism and work clamp mechanism do not operate. • One of error E-06 and E-07 is displayed. • Cutter does not operate. • Error E-08 is displayed.
2	Input signal spare 2	
3	Input signal spare 3	
4	Input signal spare 4	
5	Input signal spare 5	
6	Cutter home position sensor signal	
7	Feed PM overcurrent signal	
8	Work clamp PM overcurrent signal	
9	+55V relay input signal	
10	+55V voltage watch signal	
11	-	
12	-	
13	0V	
14	0V	
15	0V	
16	0V	
17	-	
18	-	
19	-	
20	-	
21	Cutter return signal	
22	Cutter signal	
23	Cutter signal	
24	Spare solenoid 1	
25	Spare solenoid 2	
26	Spare solenoid 3	

3. Circuit board connectors [1-step power supply circuit board]

CN1

Pin no.	Signal name	Probable symptoms due to poor contact
1	P8V (+8V)	• The zigzag home position can not be found. • The zigzag mechanism does not operate. • Error E-05 is displayed. • The machine motor does not turn.
2	0V	
3	N8V (-8V)	
4	OV. Det	
5	RY. out	
6	OV. FAULT	
7	+5V	
8	PHOTO	
9	U	
10	V	
11	W	
12	U	
13	V	
14	W	
15	IPM. FAULT	

CN2

Pin no.	Signal name	Probable symptoms due to poor contact
1	AC200-R (200V specifications)	• The zigzag home position can not be found. • The zigzag mechanism does not operate. • Error E-05 is displayed. • The tension release solenoid does not operate.
2	AC200-T (200V specifications)	
3	-	
4	-	

CN3

Pin no.	Signal name	Probable symptoms due to poor contact
1	AC220-R (100/110/220/380/400V specifications)	• The zigzag home position can not be found. • The zigzag mechanism does not operate. • Error E-05 is displayed. • The tension release solenoid does not operate.
2	-	
3	AC220-T (100/110/220/380/400V specifications)	
4	-	

CN4

Pin no.	Signal name	Probable symptoms due to poor contact
1	AC230/240-R (230V specifications)	• The zigzag home position can not be found. • The zigzag mechanism does not operate. • Error E-05 is displayed. • The tension release solenoid does not operate.
2	-	
3	-	
4	AC230/240-T (230V specifications)	

CN5

Pin no.	Signal name	Probable symptoms due to poor contact
1	DC300V	• The zigzag home position can not be found. • The zigzag mechanism does not operate. • Error E-05 is displayed.
2	DC0V	

CN6

Pin no.	Signal name	Probable symptoms due to poor contact
1	Resistance	• Voltage error occurs. • Error E-95 is displayed.
2	Resistance	

4. Circuit board connectors [2-step power supply circuit board]

P1 [POWER]

Pin no.	Signal name	Probable symptoms due to poor contact
1	+55V (for PM power supply) DC55V	• The work clamp home position and feed home position can not be found. • The work clamp mechanism and feed mechanism do not operate. • One of error E-06 and E-07 is displayed. • Cutter does not operate. • Error E-08 is displayed.
2	+55V (for PM power supply) DC55V	
3	P0V	
4	P0V	
5	+24V	
6	0V	
7	M55V (for cutter power supply) DC55V	
8	M55V (for cutter power supply) DC55V	
9	MP0V	
10	MP0V	

P3 [PER]

Pin no.	Signal name	Probable symptoms due to poor contact
1	Relay input signal	• The feed home position and work clamp home position can not be found. • The feed mechanism and work clamp mechanism do not operate. • One of error E-06 and E-07 is displayed. • +55 V (power supply for driving the feed mechanism and work clamp PM) control is not possible. • Error E-44 is displayed.
2	0V	
3	+55V relay output signal	
4	+55V OFF signal	
5	0V	

P4 [ACIN]

Pin no.	Signal name	Probable symptoms due to poor contact
1	ACIN (Power supply input)	• The feed home position and work clamp home position can not be found. • The feed mechanism and work clamp mechanism do not operate. • One of error E-06 and E-07 is displayed.
2	ACIN (Power supply input)	
3	-	
4	EARTH	

5. Circuit board connectors [Panel PCB]

P1 [PANEL]

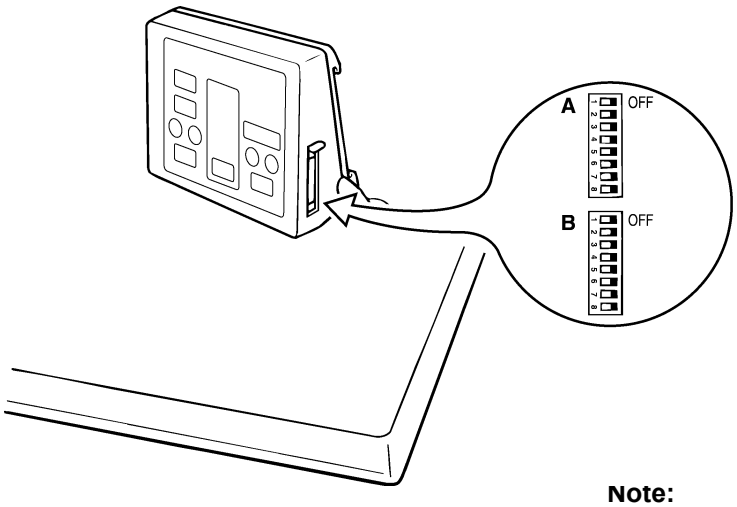
Pin no.	Signal name	Probable symptoms due to poor contact
1	+5V	• The operation panel does not operate.
2	0V	
3	KEY0	
4	KEY1	
5	KEY2	
6	OC	
7	A	
8	B	
9	C	
10	D	
11	E	
12	F	
13	G	
14	STB	
15	P8V	
16	SENSOR	
17	BUZZER	
18	0V	
19	0V	
20	0V	

6-5. Description of DIP switches

6-5-1. Panel DIP switches

Always turn off the power supply before changing any of the DIP switch settings.
Any changes to the DIP switch positions will not be effective until the power is switched off and back on again.

3993Q



Note:
Move the switches properly.

DIP switch A

No.	ON/OFF	Setting items	Default
1	ON	Work clamp remains lowered after sewing is complete (rises when treadle is depressed backward)	OFF
	OFF	Work clamp rises after sewing is complete	
2	ON	-	OFF
	OFF	-	
3	ON	Pausing enabled during automatic sewing when the treadle is depressed backward	OFF
	OFF	Pausing disabled during automatic sewing when the treadle is depressed backward	
4	ON	Display setting during automatic mode = bobbin thread counter (Default: 100)	OFF
	OFF	Display setting during automatic mode = production counter (Default: 0)	
5	ON	2-cycle sewing ON (All programs will be set to 2-cycle sewing regardless of the setting for parameter No. 55.)	OFF
	OFF	2-cycle sewing OFF	
6	ON	-	OFF
	OFF	-	
7	ON	Upper thread breakage detection disabled	OFF
	OFF	Upper thread breakage detection enabled	
8	ON	Programs disabled	OFF
	OFF	Programs enabled	

DIP switch B

No.	ON/OFF	Setting items	Default
1	ON	-	OFF
	OFF	-	
2	ON	-	OFF
	OFF	-	
3, 4, 5	ON, ON, ON	Panel DIP switches B - No. 7 and No. 8 are enabled.	OFF, OFF, OFF
	ON, ON, OFF	Work clamp size: 7.3 × 36.0 mm (Sewing area: 6.0 × 32.0 mm)	
	ON, OFF, ON	Work clamp size: 7.3 × 24.5 mm (Sewing area: 6.0 × 20.0 mm)	
	ON, OFF, OFF	Work clamp size: 6.8 × 36.0 mm (Sewing area: 5.4 × 32.0 mm)	
	OFF, ON, ON	Work clamp size: 6.8 × 24.5 mm (Sewing area: 5.4 × 20.0 mm)	
	OFF, ON, OFF	Panel DIP switches B - No. 7 and No. 8 are enabled.	
	OFF, OFF, ON	Work clamp size: 5.4 × 19.0 mm (Sewing area: 4.0 × 15.0 mm)	
	OFF, OFF, OFF	Panel DIP switches B - No. 7 and No. 8 are enabled.	
6	ON	Needle plate size: 5.4 mm (Max. needle zigzag feed width = 4.0 mm)	OFF
	OFF	Needle plate size: 7.3 mm (Max. needle zigzag feed width = 6.0 mm)	
7, 8	ON, ON	Work clamp size: 7.3 × 47.0 mm (Sewing area: 6.0 × 40.0 mm)	OFF, OFF
	ON, OFF	Work clamp size: 6.8 × 47.0 mm (Sewing area: 5.4 × 40.0 mm)	
	OFF, ON	Work clamp size: 5.4 × 24.5 mm (Sewing area: 4.0 × 20.0 mm)	
	OFF, OFF	Work clamp size: 5.4 × 36.0 mm (Sewing area: 4.0 × 32.0 mm)	

* If the programs are initialized when Nos. 3, 4 and 5 are set to OFF, OFF and ON respectively, the initial value for parameter No. 02 - Cutter size will be set to 6.0 mm. (Normal default value is 13.0 mm.)

6-5-2. Circuit board DIP switches

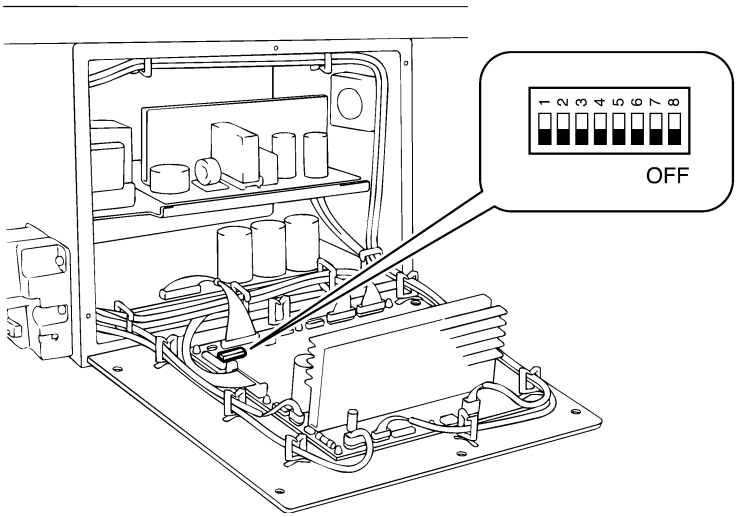
⚠ DANGER

Wait at least 5 minutes after turning off the power switch and disconnecting the power cord from the wall outlet before opening the face plate of the control box. Touching areas where high voltages are present can result in severe injury.

Always turn off the power supply before changing any of the DIP switch settings.
Any changes to the DIP switch positions will not be effective until the power is switched off and back on again.

Circuit board DIP switch 1

3994Q

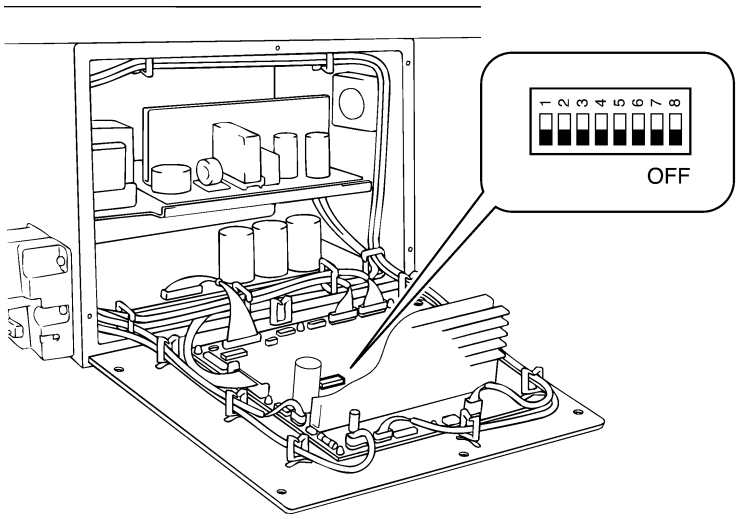


Note:
Move the switches properly.

No.	ON/OFF	Setting items	Default
1	ON	-	OFF
	OFF	-	
2	ON	-	OFF
	OFF	-	
3	ON	-	OFF
	OFF	-	
4	ON	-	OFF
	OFF	-	
5	ON	-	OFF
	OFF	-	
6	ON	-	OFF
	OFF	-	
7	ON	Three warning beeps	OFF
	OFF	Continuous warning beep	
8	ON	Zigzag motor energization is turned off during pauses or when a thread breakage occurs	OFF
	OFF	Zigzag motor energization is not turned off during pauses or when a thread breakage occurs	

Circuit board DIP switch 2

3995Q



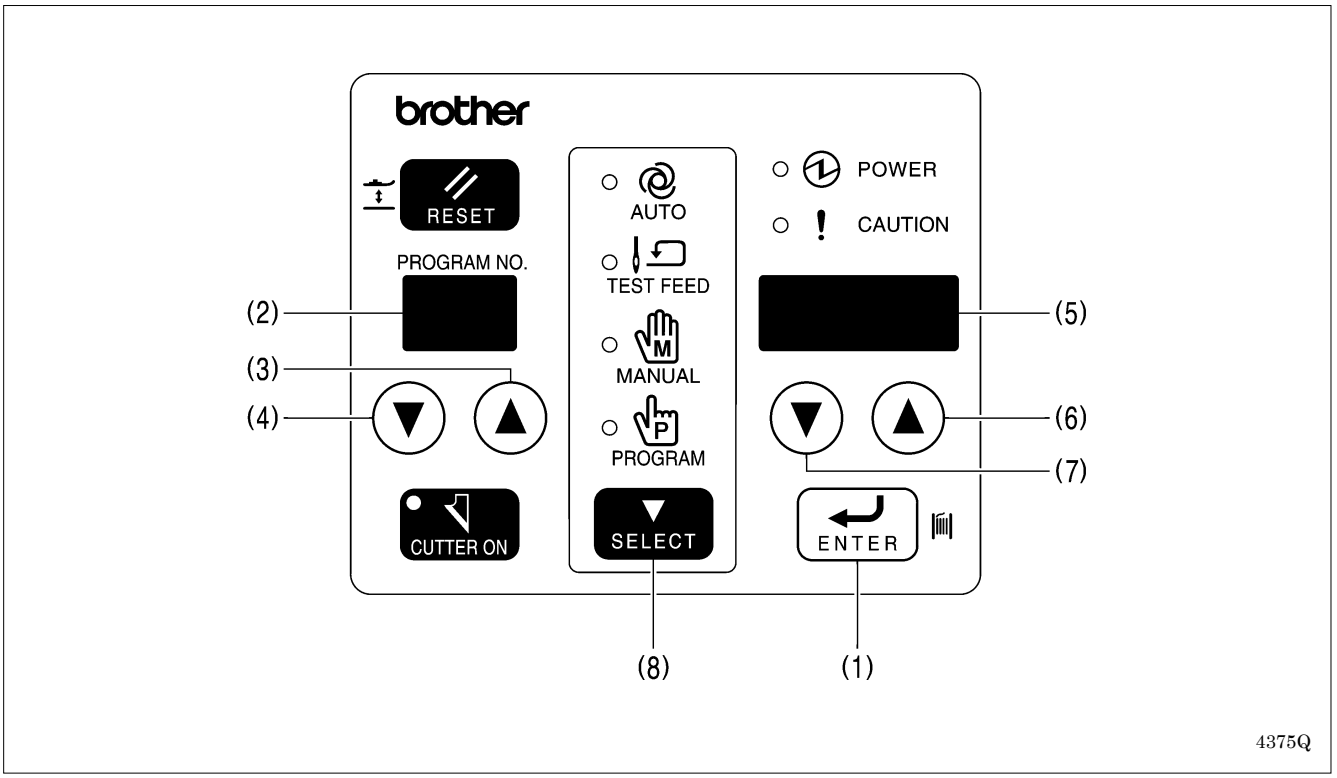
Note:
Move the switches properly.

No.	ON/OFF	Setting items	Default
1	ON	Pedal: for standing operation	OFF
	OFF	Pedal: for seated operation	
2	ON	Starting possible only when work clamp is lowered	OFF
	OFF	Starting possible regardless of work clamp position	
3	ON	During standing pedal operation, the work clamp lowers only while the work clamp pedal is being depressed.	OFF
	OFF	During standing pedal operation, the work clamp keeps lowering when the work clamp pedal is released.	
4	ON	-	OFF
	OFF	-	
5	ON	-	OFF
	OFF	-	
6	ON	100V, 110V specifications	ON/OFF
	OFF	200V, 220V, 230V, 380V, 400V specifications	
7	ON	-	OFF
	OFF	-	
8	ON	-	OFF
	OFF	-	

6-6. Description of machine motor parameters

Note:

Do not change the default values for the machine motor parameters unless it is absolutely necessary to do so.



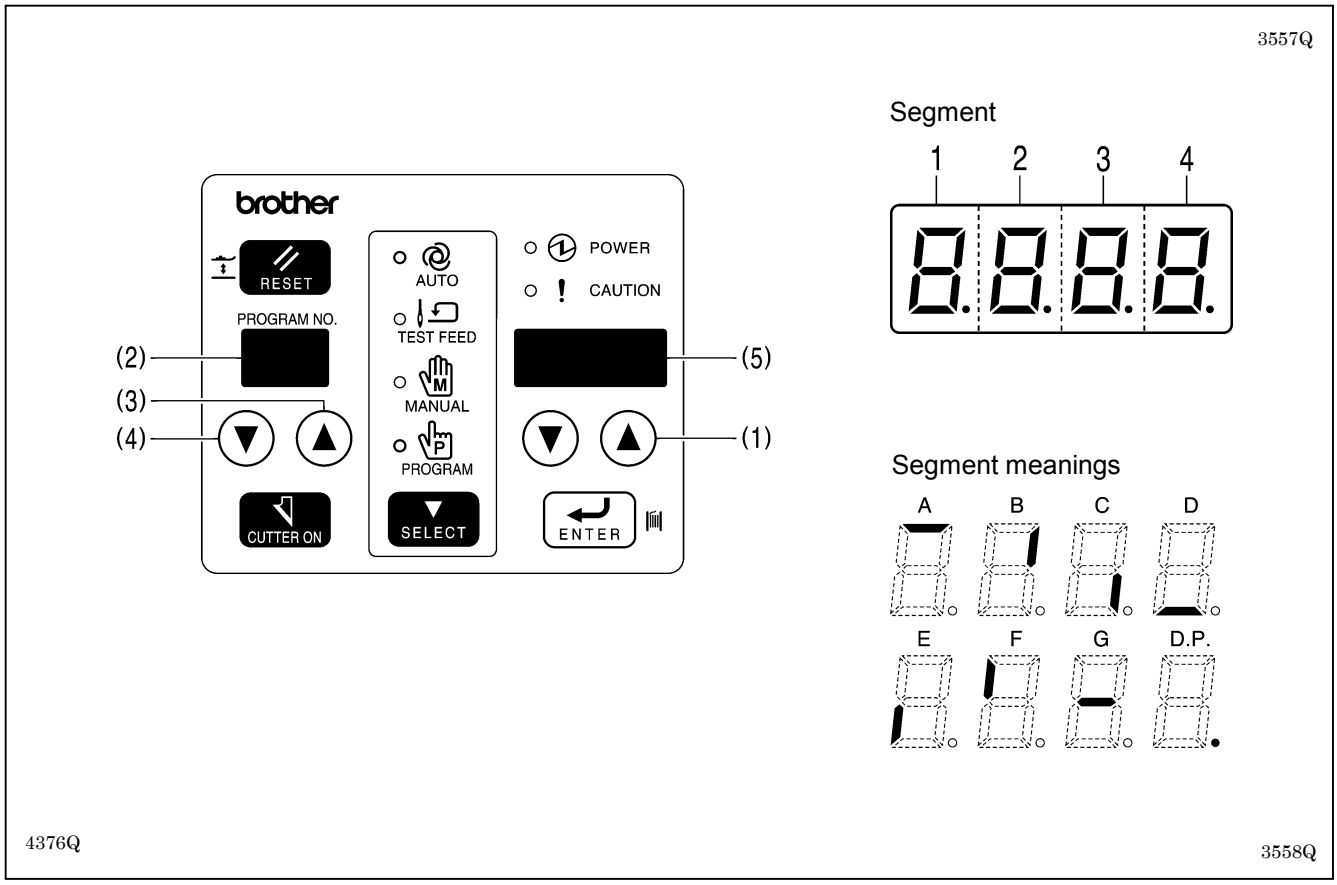
1. Turn on the power while pressing the ENTER key (1).
   * Machine motor parameter setting mode will then start, and the machine motor parameter number will flash in the program number LED (2).
2. Press the program No. keys (3) and (4) to select the number for the machine motor parameter to be changed.
3. Press the ENTER key (1).
   * The program number LED (2) will stop flashing and illuminate steadily, and the parameter setting will flash in the parameter display LED (5).
4. Press the parameter keys (6) and (7) to change the parameter setting, and then press the ENTER key (1).
   * The parameter setting will be changed and the parameter display LED (5) will stop flashing and illuminate steadily.
5. Press the SELECT key (8) to change the mode to automatic mode.

No.	Setting items	Setting range	Unit	Default
00	Machine motor stopping position	5 - 70 (forward for larger values)	1	47
01	Machine motor braking force	5 - 15 (stronger for larger values)	1	11
02	Machine motor braking time	50 - 500 ms	10	70
03	Machine motor acceleration time	5 - 70 (faster for larger values)	1	46 (13*)
04	Machine motor deceleration time	5 - 70 (faster for larger values)	1	46
05	Machine motor stopping speed	150 - 200 rpm	10	190
06	Spare	-	-	-
07	Spare	-	-	-
08	Spare	-	-	-
09	Spare	-	-	-

* For 100 V and 110 V specifications, the initial value of the parameter No. 03 is set to 13.

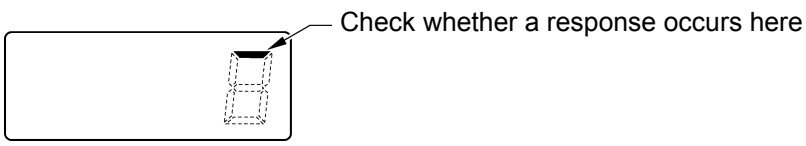
6-7. Input check list

Use the following procedure when checking for switch and sensor breakdown, cord breakage, and adjusting the sensor positions.
The CPU can be checked as to whether it has correctly interpreted signals from switches and sensors.



1. Turn on the power while pressing the parameter UP key (1).
   * Input check mode will be activated and the check mode value will be displayed in the program No. LED (2).
2. Press the program No. keys (3) and (4) to select a desired check mode (F1 - F3).
3. When the switch or sensor is turned on, the corresponding segment on the parameter display LED (5) or indicators on the operation panel will react.
   * Turn the switch on and off to check it, and move the object by hand to check the sensor.
4. When returning to normal operation, turn power off and then on again.

<Example> When checking the cloth presser switch (Segment 4-A)

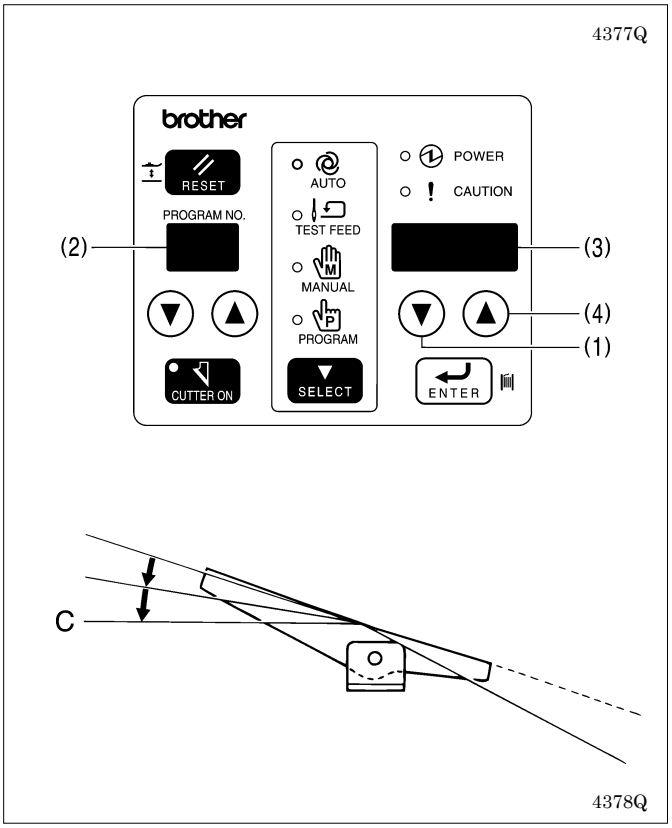


No.	Check mode	Check items	Indicator / Segment
1	F1	Parameter UP key	Automatic mode indicator
2		Parameter DOWN key	Test feed mode indicator
3		ENTER key	Manual mode indicator
4		SELECT key	Program mode indicator
5		RESET key	Warning indicator
6		CUTTER ON key	Cutter on indicator
7		Work clamp switch	Segment 4-A
8		Work clamp lifter switch	Segment 4-B
9		Start switch	Segment 4-D
10		Needle up sensor	Segment 4-E
11		Needle down sensor	Segment 4-F
12		Timing sensor	Segment 4-G
13		Zigzag home position sensor	Segment 3-G
14		Feed home position sensor	Segment 3-B
15		Work clamp home position sensor	Segment 3-C
16		Cutter home position sensor	Segment 3-D
17		Upper thread breakage detection sensor	Segment 3-F
18		Stop switch	Segment 2-A
19		Pause connection signal	Segment 2-B
20	F2	Panel DIP switch B-No.1	Segment 4-A
21		Panel DIP switch B-No.2	Segment 4-B
22		Panel DIP switch B-No.3	Segment 4-C
23		Panel DIP switch B-No.4	Segment 4-D
24		Panel DIP switch B-No.5	Segment 4-E
25		Panel DIP switch B-No.6	Segment 4-F
26		Panel DIP switch B-No.7	Segment 4-G
27		Panel DIP switch B-No.8	Segment 4-D.P
28		Panel DIP switch A-No.1	Segment 3-A
29		Panel DIP switch A-No.2	Segment 3-B
30		Panel DIP switch A-No.3	Segment 3-C
31		Panel DIP switch A-No.4	Segment 3-D
32		Panel DIP switch A-No.5	Segment 3-E
33		Panel DIP switch A-No.6	Segment 3-F
34		Panel DIP switch A-No.7	Segment 3-G
35		Panel DIP switch A-No.8	Segment 3-D.P

No.	Check mode	Check items	Indicator / Segment
36	F2	Circuit board DIP switch 2-No.1	Segment 2-A
37		Circuit board DIP switch 2-No.2	Segment 2-B
38		Circuit board DIP switch 2-No.3	Segment 2-C
39		Circuit board DIP switch 2-No.4	Segment 2-D
40		Circuit board DIP switch 2-No.5	Segment 2-E
41		Circuit board DIP switch 2-No.6	Segment 2-F
42		Circuit board DIP switch 2-No.7	Segment 2-G
43		Circuit board DIP switch 2-No.8	Segment 2-D.P
44		Circuit board DIP switch 1-No.1	Segment 1-A
45		Circuit board DIP switch 1-No.2	Segment 1-B
46		Circuit board DIP switch 1-No.3	Segment 1-C
47		Circuit board DIP switch 1-No.4	Segment 1-D
48		Circuit board DIP switch 1-No.5	Segment 1-E
49		Circuit board DIP switch 1-No.6	Segment 1-F
50		Circuit board DIP switch 1-No.7	Segment 1-G
51		Circuit board DIP switch 1-No.8	Segment 1-D.P
52	F3	Pedal switch analog value	The value is displayed in the parameter display LED. * When the treadle is depressed forward, the value becomes larger, and when it is depressed backward, the value becomes smaller. * The neutral position is set to 78 ± 3 at the time of shipment from the factory.

6-8. Output check list

Use the following procedure when checking for PCB-related failures, mechanism breakdown, and cord breakage. It can be checked as to whether signals that the CPU correctly output have been received.



1. Turn on the power while pressing the parameter DOWN key (1).
   * All mode indicators will switch off, [_ _] will be displayed in the program No. LED (2) and [_ _ _ _] will be displayed in the parameter display LED (3).
2. Depress the treadle to the 2nd step [C].
   * The machine will start to detect the home position, and then output check mode will start.
   * The check code will appear in the parameter display LED (3).
3. Press the parameter keys (1) and (4) to select the desired check code.
4. Depress the treadle to the 2nd step [C].

   The operation corresponding to the check code will be carried out while the treadle is being depressed forward (each time the treadle is depressed forward for check codes C-08 and C-09).

5. When returning to normal operation, turn power off and then on again.

Check code	Function
C-01	The buzzer sounds for one second, and then the operation panel indicators and LEDs all light. After this, numbers from "0" to "9" are displayed in the two program No. LED columns and the four parameter display LED columns.
C-02	The buzzer sounds for one second, and then the sewing machine motor starts running at 700 rpm. While the motor is running, a timing signal input check is carried out. If there is an abnormality in the timing signal, E-64 is displayed.
C-03	The buzzer sounds for one second, and then the work clamp motor starts operating (sensor home position - 13 mm). At this time, the upper thread trimmer and lower thread trimmer operate together with the work clamp.
C-04	The buzzer sounds for one second, and then the needle zigzag motor starts operating (-3 mm - 3 mm).
C-05	The buzzer sounds for one second, and then the feed motor starts operating (-1 mm - 40 mm).
C-06	The buzzer sounds for one second, and then the feed mechanism operates for 15 mm → then moves to the home position → then the cutter solenoid turns on and off → then the cutter return solenoid turns on and off.
C-07	The buzzer sounds for one second, and then the tension release solenoid turns on and off.
C-08*	The buzzer sounds for one second, and then the work clamp moves to the upper thread trimming position (position [6] for the operation procedure in "1-10. Upper thread trimmer mechanism"). When the treadle is depressed forward again to the 2nd step [C], the work clamp moves to the home position. **Note:** If the work clamp is not at the home position, the check code cannot be changed.
C-09	The buzzer sounds for one second, and then the work clamp lifts by 13 mm. When the treadle is depressed forward again to the 2nd step [C], the work clamp moves to the home position. **Note:** If the work clamp is not at the home position, the check code cannot be changed.

* This function can be used to make fine adjustments to the position of the work clamp. (Refer to "4-14-5. Adjusting the cutting depth of the upper thread scissors".)

6-9. Error code table

⚠ DANGER

⚠ Wait at least 5 minutes after turning off the power switch and disconnecting the power cord from the wall outlet before opening the face plate of the control box. Touching areas where high voltages are present can result in severe injury.

If a malfunction should occur with the sewing machine, a buzzer will sound and an error code will appear in the display window. Follow the remedy procedure to eliminate the cause of the problem.

- For errors which do not require the power to be turned off (i.e. errors which can be reset), two short beeps will sound. For error E-02, three short beeps will sound.
- For errors which require the power to be turned off (i.e. errors which cannot be reset), a single long beep will sound.

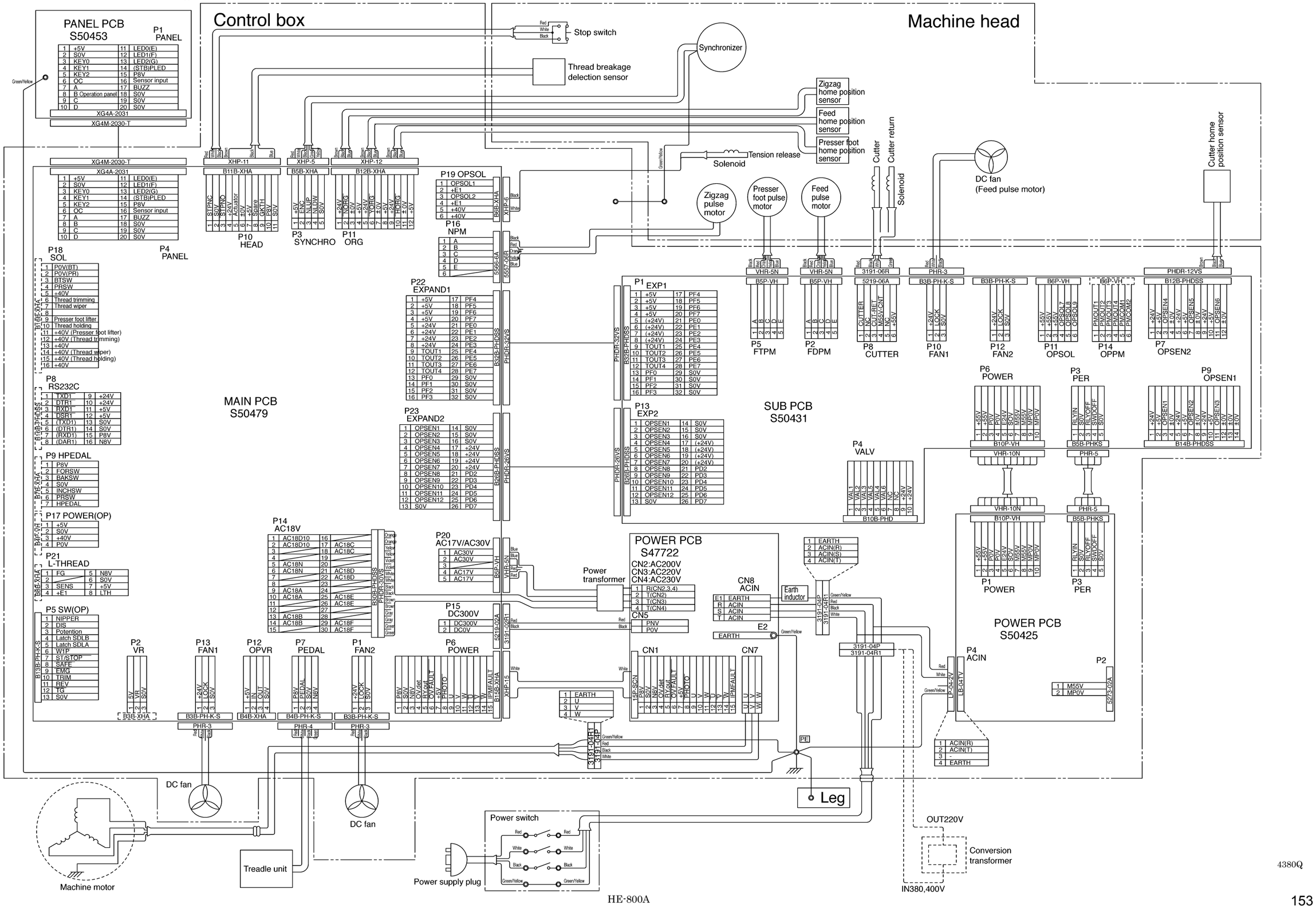
Code	Cause	Remedy
E-00	STOP switch was pressed.	1. Release the STOP switch. · To restart sewing, press the parameter DOWN key and then depress the treadle to step 2. · To cancel sewing, press the RESET key. 2. If an error still occurs after 1. is carried out, check that connector P10 on the main P.C. board is properly connected.
E-01	Upper thread breakage	1. Thread the thread, or check that the thread has been passed through the thread guide. · To restart sewing, press the parameter DOWN key and then depress the treadle to step 2. · To cancel sewing, press the RESET key. 2. If an error still occurs after 1. is carried out, check that connector P10 on the main P.C. board is properly connected.
E-02	Needle up sensor is OFF.	1. Turn the pulley by hand to set the needle to its highest position. 2. Check if the sewing machine operation is sluggish because of a reason such as thread tangled around the rotary hook. 3. If an error still occurs after 1. and 2. are carried out, check that connector P3 on the main P.C. board is properly connected.
E-05	Zigzag positioning is not carried out.	1. Turn off the power. 2. Check that connector P11 on the main P.C. board is properly connected. 3. Check the operation of the zigzag home position sensor monitor lamp.
E-06	Feed positioning is not carried out.	1. Turn off the power. 2. Check that connector P11 on the main P.C. board is properly connected. 3. Check the operation of the feed home position sensor monitor lamp.
E-07	Work clamp positioning is not carried out.	Turn off the power. <If E-07 occurs other than when machine is moving to the home position or starting> 1. Check that connector P11 on the main P.C. board is properly connected. 2. Check the operation of the work clamp home position sensor monitor lamp. <If E-07 occurs when machine is starting> 1. Check the upper thread trimming mechanism, particularly for wear in the opening cam. 2. Apply grease to the inclined face of the opening cam.
E-08	Cutter home position sensor is off.	1. Turn off the power. 2. Check if the solenoid stopper tightening nut or the cutter sensor mounting screw is loose and if the cutter solenoid (shaft, etc.) is damaged. 3. Check that connector P23 on the main P.C. board and connector P13 on the sub P.C. board are properly connected. 4. Check the operation of the cutter home position sensor monitor lamp.

Code	Cause	Remedy
E-20	Feed and work clamp motor overcurrent	1. Turn off the power and check that the feed mechanism is normal and that the work clamp moves smoothly. 2. Check that connectors P2 and P5 on the sub P.C. board are properly connected. 3. Check that connector P22 on the main P.C. board and connector P10 on the sub P.C. board are properly connected.
E-21	Zigzag motor overcurrent	1. Turn off the power and check if the zigzag mechanism moves smoothly. 2. Check that connector P16 on the main P.C. board is properly connected.
E-30	Treadle is depressed to step 2.	1. Return the treadle to the neutral position. 2. If an error still occurs after 1. is carried out, check that connector P7 on the main P.C. board is properly connected.
E-31	Treadle is depressed to step 1.	1. Return the treadle to the neutral position. 2. If the error still occurs after step 1 is carried out, adjust the threshold value for memory switch No. 08 to a positive value. 3. Check that connector P7 on the main P.C. board is properly connected.
E-32	Treadle is depressed backward.	1. Return the treadle to the neutral position. 2. If the error still occurs after step 1 is carried out, adjust the threshold value for memory switch No. 07 to a negative value. 3. Check that connector P7 on the main P.C. board is properly connected.
E-40	Control circuit board heat sink is overheating.	1. Turn off the power and check that the inside of the control box is being properly ventilated. 2. Clean the filter of the air intake and the cooling fan. (Remove dust.)
E-41	Inside air circulation fan problem	1. Turn off the power and clean the inside air circulation cooling fan. (Remove dust.) 2. Check that connectors P13 and P20 on the main P.C. board are properly connected. 3. Check that connectors CN2, CN3 and CN4 on the 1-step power supply circuit board are properly connected.
E-42	Exhaust fan problem	1. Turn off the power and clean the exhaust cooling fan. (Remove dust.) 2. Check that connectors P1 and P20 on the main P.C. board are properly connected. 3. Check that connectors CN2, CN3 and CN4 on the 1-step power supply circuit board are properly connected.
E-44	2-step power supply circuit board +55V relay error	1. Turn off the power. 2. Check that connector P3 on the sub P.C. board is properly connected. 3. Check that connectors P3 and P4 on the 2-step power supply circuit board are properly connected. 4. Check that connectors P10 and P13 on the sub P.C. board are properly connected. 5. Check that connectors P22 and P23 on the main P.C. board are properly connected. * This error can occur if a three-phase sewing machine is used with a single-phase power supply.
E-51	X pitch error	Turn off the power and initialize the parameter settings.
E-52	Y pitch error	Turn off the power and initialize the parameter settings.
E-53	Multi-working knife error	Use the programming device (the programming software for the electronic pattern sewer or a programmer) to delete multi-working knife operations.
E-54	Overall cycle program stitch no. error (Exceeds 3,000 stitches.)	Clear the cycle program to reset the error automatically.

Code	Cause	Remedy
E-55	Stitch no. error (Exceeds 700 stitches.)	1. Turn off the power and then back on again. * The zigzag pitch, front tack pitch and rear tack pitch will be automatically doubled and the error will be cleared. 2. If an error still occurs after 1. is carried out, turn off the power and initialize the parameter settings.
E-59	Sewing data error	Turn off the power and initialize the parameter settings.
E-62	Needle up error during operation	Turn off the power. <Software> ▪ If the sewing machine stops before the needle up position, reduce the setting value for machine motor parameter No. 00 (machine motor stopping position). ▪ If the sewing machine stops after the needle up position, increase the setting value for machine motor parameter No. 00 (machine motor stopping position). <Hardware> 1. Turn the pulley by hand and check if the upper shaft locks or not. 2. If an error still occurs after 1. is carried out, check that connector P3 on the main P.C. board is properly connected.
E-63	Needle down error during operation	1. Turn off the power. 2. Turn the pulley by hand and check if the upper shaft locks or not. 3. If an error still occurs after 1. is carried out, check that connector P3 on the main P.C. board is properly connected.
E-64	Timing signal error during operation	1. Turn off the power. 2. Turn the pulley by hand and check if the upper shaft locks or not. 3. If an error still occurs after 1. is carried out, check that connector P3 on the main P.C. board is properly connected.
E-70	Machine motor running error	1. Turn off the power. 2. Check that machine motor harness connector CN7 on the 1-step power supply circuit board is properly connected. 3. Check that the pins of machine motor harness connector CN7 are inserted correctly.
E-74	EEPROM error	Turn off the power and replace the main P.C. board.
E-80	Communication ready error	1. Turn off the power. 2. Check that there is data in the main circuit board ROM. 3. Check that the ROM chips of the main P.C. board are properly connected. (Check position, orientation, lead clinching.)
E-81	Communication error	1. Turn off the power. 2. Check that there is data in the main circuit board ROM. 3. Check that the ROM chips of the main P.C. board are properly connected. (Check position, orientation, lead clinching.)
E-90	Machine motor overload (Excessive load during sewing.)	1. Turn off the power. 2. Turn the pulley by hand and check if the upper shaft locks or not. 3. Check that connectors P3 and P6 on the main P.C. board are properly connected. 4. Check that machine motor harness connector CN7 and power supply harness connector CN8 on the 1-step power supply circuit board are properly connected.

Code	Cause	Remedy
E-92	Machine motor operation error	1. Turn off the power. 2. Turn the pulley by hand and check if the upper shaft locks or not. 3. Check that connectors P3 and P6 on the main P.C. board are properly connected. 4. Check that machine motor harness connector CN7 and power supply harness connector CN8 on the 1-step power supply circuit board are properly connected.
E-93	Blown solenoid fuse	1. Turn off the power. 2. Check fuse F1 on the main P.C. board. If it is blown replace it.
E-94	Machine motor IC error	1. Turn off the power. 2. Turn the pulley by hand and check if the upper shaft locks or not. 3. Check that connectors P3 and P6 on the main P.C. board are properly connected. 4. Check that machine motor harness connector CN7 and power supply harness connector CN8 on the 1-step power supply circuit board are properly connected.
E-95	Power supply voltage error (high)	1. Turn off the power. 2. Check the power supply voltage in the workplace and the power supply voltage specifications for the control box. 3. Check the connection positions of connectors CN2, CN3 and CN4 on the 1-step power supply circuit board. · 200V specification …CN2 · 100V, 110V, 220V, 380V, 400V specifications … CN3 · 230V specification … CN4
E-96	Power supply voltage error (low)	1. Turn off the power. 2. Check the power supply voltage in the workplace and the power supply voltage specifications for the control box. 3. Check the connection positions of connectors CN2, CN3 and CN4 on the 1-step power supply circuit board. · 200V specification …CN2 · 100V, 110V, 220V, 380V, 400V specifications … CN3 · 230V specification … CN4
E-97	Machine motor locked · Excessive load during sewing. · Motor temperature protection function has operated. (If the motor's serial number is "G03xxxxxx" or later)	1. Turn off the power. 2. Check if the timing belt is attached. 3. Turn the pulley by hand and check that the upper shaft does not lock and the pulley is not loose. 4. Check that connectors P3 and P6 on the main P.C. board are properly connected.
ArEA	Sewing data values exceed the needle plate size or work clamp size which have been set using the panel DIP switches.	Three resetting methods are available depending on the application. A. By selecting a different program number (If you would like to keep the program which exceeds the area.) 1. Press the SELECT key. 2. Select a different program number and press the ENTER key. If the data for the selected program number does not exceed the sewing area, the error will be cleared. B. By initializing the program While pressing the ENTER key, press the RESET key. All parameters (00 to 69) for the program will then be initialized and the machine will switch to program mode. C. By initializing all programs Refer to "12-1. Initializing all programs" in the instruction manual.

6-10. Control circuit block diagram



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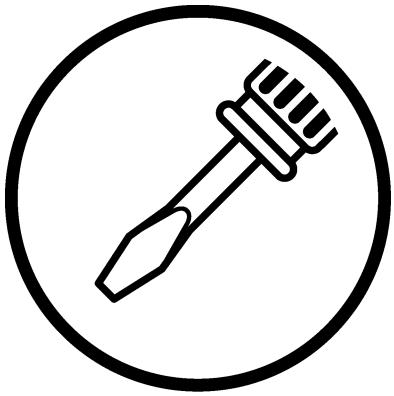

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